

Sandia National Laboratories

Primary Hazard Screening (PHS)

PHS Number: SNL06A00448-007

CINT (clean room, all labs) - Integration Lab

I. Signatures (Electronic signature dates shown)
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Risk Management DeterminationHazard Classification: **Low**Required Documentation: **PHS with integral HA**Facility/Project Designator: **Radiological Facility**Date Created: **07/06/2011**DOE Order References: **425.1D**Results as of: **08/02/2011**Submitted for Review by: **Nogan,John**

Org: 01132 Date: 07/15/2011

Author / Technical Review

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.

Author: **Nogan,John**Org: **01132**CONCUR ON SUBMIT:
07/15/2011

I have performed the above reviews and concur that those items are complete and accurate.

Industrial Facility Safety Basis SME:
Stirrup,Timothy ScottOrg: **04126**CONCUR: **07/27/2011****ES&H Coordinator Review**

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.

ES&H Coordinator: **Davis,M. Wayne**Org: **01100**CONCUR: **07/27/2011****Quality Review**

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.

PHS Team: **Hall, Christopher Armando**

Org: **04126**

CONCUR: **07/27/2011**

Approver

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.

Approving Manager: **Hearne, Sean J.**

Org: **01132**

APPROVE: **08/02/2011**

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.
- A 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 ES&H Manual chapters, sections, and supplements) that must be reviewed to determine specific requirements applicable to the work.
 - ES&H Manual-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 ES&H Manual and related documents. Furthermore, many of the requirements are identified by reference to sections of the ES&H Manual, 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 ES&H Manual 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: J

Status: **APPROVED**

Expiration Date: **08/02/2012**

Responsible Organization: **01132**

Radiological Protection Level

Radiological Protection Level for this facility of 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 Focused Ion Beam area (Room 1504 and adjoining Equipment Chase) of the CINT Integration Laboratory specifically includes normal operations and maintenance for the focused ion beam tool / secondary electron microscope tool. The primary function of the tool is to micro-machine Si micro-fabricated parts into unique geometries using a 10 nm wide stream of ionized gallium in a vacuum chamber. The chamber is exhausted to the centralized house exhaust 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.

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 Microwave (DSMW) 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

IV. Identified Hazards		
Hazard Name	Hazard Description	Source
Traffic	Traffic related hazards for injury	general corporate business process
SIH - Roving Personnel and Visitors	Roving Personnel or Visitors entering work area	general corporate business process
Common electrical hazards	Common electrical hazards	general corporate business process
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
Asphyxiant gas	Asphyxiant gas; Potential injury or death from unevaluated asphyxiant gas displacing oxygen in a workspace.	QUESTION 5d(1)a
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/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
Toxic gasses	Potential exposure to toxic gasses in the event of a release	QUESTION 5j(1)
Exposed energized circuits	Potential electrical shock or arc	QUESTION 6a
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
Potential environmental concerns	Potential for regulatory action	QUESTION 15
Wastewater discharge	Potential to exceed permitted quantities	QUESTION 15a
General Wastewater discharge	Potential to exceed permitted amounts	QUESTION 15a(1)
Air discharge	Potential to emit regulated contaminants	QUESTION 15b

Hazard Name	Hazard Description	Source
Hazardous waste	Potential for regulatory action	QUESTION 15d
Offsite Work	Hazards associated with the site's other activities	QUESTION 21a
Low - Offsite Work Condition - MOW	Hazards encountered while conducting work offsite by members of the workforce	QUESTION 21b(1)a
Offsite Work - Domestic Travel	Hazards associated with domestic travel	QUESTION 21d
Exposure to hazardous energy	Potential injury to personnel from exposure to hazardous energy	QUESTION C3

V. Required Actions

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.** 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)
- 3.** Equipment specific procedures are required for servicing and maintenance according to the requirements of Corporate Procedure: ESH100.2.IS.2, "Control Hazardous Energy (Lockout/Tagout)." (QUESTION C3a(1)b)
- 4.** 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)
- 5.** 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)
- 6.** 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)
- 7.** There may also be requirements for waste minimization and documentation of waste minimization efforts/results. Contact the Pollution Prevention Team for assistance with waste minimization. (QUESTION 15d)
- 8.** There may be hazards from other operations at the host site that could affect workers covered by this PHS; these hazards may change over time. Identify these hazards and any required safeguards to workers. This often involves establishing ongoing communications with the host facility about their hazards and required safeguards. You can also refer to Sandia's Roving Personnel Guidelines for additional information. (QUESTION 21a)
- 9.** 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)
- 10.** 10 Code of Federal Regulations Part 851, Worker Safety and Health Program, as implemented through various Sandia 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)

11. Flammable and combustible liquids must be bonded in accordance with the requirements in: The Sandia, "Record of Code Decision." (QUESTION 5g)

12. Any activity inside the Limited Approach Boundary is considered working near energized parts and requires a senior-manager-approved technical work document (TWD). (QUESTION 6a)

13. Hazards in your work area could impact Roving Personnel or Visitors. Evaluate these hazards and implement the appropriate precautions to protect these persons (e.g., access control, required PPE, training, escorts, pre-entry briefings, emergency procedures briefing). (general corporate business process)

Action Messages

1. As required by ES&H, Corporate Procedure: ESH100.2.ENV.22, "Manage Hazardous Waste at SNL," Members of the Workforce who are owners or generators of hazardous waste shall plan how to control hazards and appropriately manage their hazardous waste. (QUESTION 15d)

Response: Members of the Workforce who are owners or generators of hazardous waste plan how to control hazards and appropriately manage their hazardous waste.

2. Contact your Division ES&H Team for a survey. (QUESTION 1a)

Response: Surveys have been completed.

3. Contact your Division ES&H Team Industrial Hygienist to evaluate exposure to chemicals and determine control measures, prior to working with chemicals. (QUESTION 5a)

Response: The Industrial Hygienist has evaluated exposure to chemicals and determined any needed control measures.

4. Where eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for emergency quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use. See Corporate Procedures ESH100.2.IH.13, Work with Injurious Corrosive Materials and Manage Safety Shower and Eyewash Use, for requirements. (QUESTION 5e)

Response: Suitable facilities for emergency quick drenching or flushing of the eyes and body are provided within the work area for immediate emergency use.

5. Refer to "Record of Code Decision," with a subject of, "Storage, Dispensing, Bonding, and Grounding of Flammable and Combustible Liquids." Contact Fire Protection Engineering for assistance. See the ES&H Direct Access Services List. (QUESTION 5g)

Response: As needed, personnel will contact Fire Protection Engineering for assistance.

6. 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. 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 Standard Operating Procedures (SOPs) and Operating Procedures (OPs). 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 6a)

Response: The department manager will determine each employee's electrical qualifications.

7. Use a technical work document (TWD) to perform energized work as follows: If the energized work is diagnostic (such as troubleshooting, measuring voltage, etc.), an OP is required. You can find an example of a completed energized electrical OP on the Electrical Safety homepage. This could easily be used as a template for any R&D electrical activity. If the work involves manipulation or reconfiguration of an energized component, an Energized Work Permit (EWP) must be completed. A EWP is needed each time such tasks are to be completed. An EWP may be obtained from the SNL internal web under Corporate Forms EWP-SF2005-EWP (10-2005). (QUESTION 6a)

Response: A TWD is in place in the lab.

8. The energized work decision tool shall be used to determine PPE and hazard analysis requirements. Prior to PPE use, workers shall receive site-specific PPE training. See Corporate Procedure: ESH100.2.IS.8, "Assess Workplace Hazards and Provide and Maintain Personal Protective Equipment" for requirements regarding site-specific PPE training. See MN471004, Electrical Safety Manual, Section 2.10, "Electrical Personal Protective Equipment" for requirements. (QUESTION 6a)

Response: The energized work decision tool will be used to determine PPE and hazard analysis requirements. Prior to PPE use, workers will receive site-specific PPE training.

9. Implement actions and control measures specified in the applicable Industrial Hygiene exposure assessment. (QUESTION 8a)

Response: Personnel have implemented any needed actions and control measures specified in the applicable Industrial Hygiene exposure assessment.

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 C2a(1), QUESTION 5			

ELC106	R&D ELECTRICAL SAFETY (> 50 VOLTS)	ELC106, unless not required by the energized work decision tool	--	Yes
	Required by: QUESTION 6a(2)			
ELC106R	R&D ELECTRICAL SAFETY REFRESHER (> 50 VOLTS)		3	No
	Required by: QUESTION 6a(2)			
ENV112	HAZARDOUS WASTE & ENVIRONMENTAL MANAGEMENT TRAINING	(all locations other than SNL/CA will take ENV112)	1	No
	Required by: QUESTION 15d			
ESH100	ES&H AWARENESS		1	No
	Required by: general corporate business process			
ESH200	SAFETY MANAGEMENT	ESH200 for new managers only	--	Yes
	Required by: general corporate business process			
LTO210	LOCKOUT/TAGOUT FOR AUTHORIZED WORKERS		3	No
	Required by: QUESTION C3a(1)b			
LTO220	ANNUAL LOCKOUT/TAGOUT (LOTO) ROLES & RESPONSIBILITIES FOR AUTHORIZED WORKERS		1	No
	Required by: QUESTION C3a(1)a, QUESTION C3a(1)b			
MCH200	HAND AND POWER TOOL SAFETY	unless OJT	--	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	PPE106 unless CHM103 trained. (CHM103 identifies PPE associated with Chemicals; PPE106 is all other PPE)	2	No
	Required by: QUESTION C2a(1)			
PRS115	CRYOGEN SAFETY	for all operators of the system who work with cryogenics	--	Yes
	Required by: QUESTION 10c			
PRS115R	CRYOGEN SAFETY REFRESHER		3	No
	Required by: QUESTION 10c			

PRS150	PRESSURE SAFETY ORIENTATION	for all operators of the system	--	Yes
Required by: QUESTION 10a, QUESTION 10b				
PRS150R	PRESSURE SAFETY ORIENTATION REFRESHER		3	No
Required by: QUESTION 10a, QUESTION 10b				
PRS250	ADVANCED PRESSURE SAFETY	for all installers of the system	--	Yes
Required by: QUESTION 10b				
PRS250R	ADVANCED PRESSURE SAFETY REFRESHER		3	No
Required by: QUESTION 10b				
RAD102	GENERAL EMPLOYEE RADIOLOGICAL TRAINING	RAD102 unless RAD210, RAD214 (recommended), RAD230, or SNL qualified RCT training.	2	No
Required by: QUESTION 1b(1)				
RAD219	RADIATION-GENERATING DEVICE CUSTODIAN TRAINING	for both primary alternate custodians	2	No
Required by: QUESTION 1				
RAD250	MANAGEMENT OF RADIOLOGICAL OPERATIONS		2	No
Required by: QUESTION 1				
RSP215	AIR-PURIFYING RESPIRATORY PROTECTION	RSP215 (only for operations which require the use of air purifying respirators)	1	No
Required by: QUESTION C2a(1)a				
RSP217	COMPREHENSIVE RESPIRATORY PROTECTION	RSP217 (only for operations which require the use of air-supplying respirators) or (air-supplying respirators and air purifying respirators)	1	No
Required by: QUESTION C2a(1)a				
RSP230	RESPIRATORY PROTECTION FOR SUPERVISORS	RSP230 (only for manager overseeing individuals authorized for respirator use)	1	No
Required by: QUESTION C2a(1)a				

Internal Assigned Training

Course Code	Course Title	Training Interval (years)	One-time Training
ILUA100	CINT INTEGRATION LAB UNESCORTED ACCESS TRAINING	0	Yes

External Assigned Training

Course Code	Course Title	Supplier	One-time Training
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Regulatory Requirements

- 1: Corporate Procedure: ESH100.1.EP.2, "Implement NEPA, Cultural Resources, and Historic Properties Requirements" (QUESTION C4)
- 2: Corporate Procedure: ESH100.2.ENV.12, "Obtain and Comply with Air Permits" (QUESTION 15b)
- 3: Corporate Procedure: ESH100.2.ENV.13, "Control Ozone Depleting Substances" (QUESTION 15b)
- 4: Corporate Procedure: ESH100.2.ENV.14, "Comply with Radionuclide National Emissions Standards for Hazardous Air Pollutants" (QUESTION 15b)
- 5: Corporate Procedure: ESH100.2.ENV.15, "Manage Hazardous Waste at SNL/CA" (QUESTION 15d)
- 6: Corporate Procedure: ESH100.2.ENV.16, "Manage Radioactive Waste at SNL/CA" (QUESTION 15d)
- 7: Corporate Procedure: ESH100.2.ENV.17, "Manage Mixed Waste at SNL/CA" (QUESTION 15d)
- 8: Corporate Procedure: ESH100.2.ENV.20, "Manage Other Waste at SNL/CA" (QUESTION 15d)
- 9: Corporate Procedure: ESH100.2.ENV.21, "Recycle or Reuse Waste at SNL/CA" (QUESTION 15d)
- 10: Corporate Procedure: ESH100.2.ENV.22, "Manage Hazardous Waste at SNL/NM" (QUESTION 15d)
- 11: Corporate Procedure: ESH100.2.ENV.23, "Manage Radioactive Waste at SNL" (QUESTION 15d)
- 12: Corporate Procedure: ESH100.2.ENV.24, "Manage Mixed Waste at SNL" (QUESTION 15d)
- 13: Corporate Procedure: ESH100.2.ENV.26, "Manage Other Waste at SNL/NM" (QUESTION 15d)
- 14: Corporate Procedure: ESH100.2.ENV.6, "Control Discharges to the Sanitary Sewer System" (QUESTION 15a(1))

- 15:** Corporate Procedure: ESH100.2.FP.1, "Manage Fire Protection Requirements" (QUESTION 5g)

- 16:** Corporate Procedure: ESH100.2.IH.10, "Evaluate and Control Nonionizing Radiation" (QUESTION 8)
- 17:** Corporate Procedure: ESH100.2.IH.13, "Work with Injurious Corrosive Materials and Manage Safety Shower and Eyewash Use" (QUESTION 5e)
- 18:** Corporate Procedure: ESH100.2.IH.15, "Control Hazards Using Local Exhaust Ventilation and High Efficiency Particulate Air Filters" (QUESTION C1)
- 19:** Corporate Procedure: ESH100.2.IH.16, "Evaluate and Control Unbound Engineered Nanoscale Particles" (QUESTION 5c)
- 20:** Corporate Procedure: ESH100.2.IH.20, "Maintain an Accurate Chemical and Biological Material Inventory" (QUESTION 5)
- 21:** Corporate Procedure: ESH100.2.IH.3, "Control Inhalation Hazards Using Respiratory Protection" (QUESTION C2a(1)a)
- 22:** Corporate Procedure: ESH100.2.IH.4, "Evaluate and Control Chemical Hazards" (QUESTION 5)
- 23:** Corporate Procedure: ESH100.2.IS.10, "Manage Industrial Machine and Portable Power Tool Safety" (QUESTION 7b)
- 24:** Corporate Procedure: ESH100.2.IS.2, "Control Hazardous Energy (Lockout/Tagout)" (QUESTION C3a(1)a)
- 25:** Corporate Procedure: ESH100.2.IS.8, "Assess Workplace Hazards and Provide and Maintain Personal Protective Equipment" (QUESTION 6a)
- 26:** MN471000, Pressure Safety Manual, Chapter 2, "The Pressure Safety Program" (QUESTION 10c)
- 27:** MN471000, Pressure Safety Manual, Chapter 6, "Testing and Evaluating Pressure Systems" (QUESTION 10f)
- 28:** MN471000, Pressure Safety Manual, Chapter 7, "Verifying the Safe Operation of Pressure Systems" (QUESTION 10f)
- 29:** MN471000, Pressure Safety Manual, Chapter 8, "Servicing Pressure Vessels and Components" (QUESTION 10f)
- 30:** MN471000, Pressure Safety Manual, Chapter 9, "Documenting the Operational Safety of Pressure Systems" (QUESTION 10e)
- 31:** MN471004, Electrical Safety Manual, Section 2.10, "Electrical Personal Protective Equipment" (QUESTION 6a)
- 32:** MN471004, Electrical Safety Manual, Section 2.2, "Qualifications and Training" (QUESTION 6a(2))
- 33:** MN471016, Radiological Protection Procedures Manual, Chapter 1, "Radiological Work Planning and Controls" (QUESTION 1)
- 34:** MN471016, Radiological Protection Procedures Manual, Chapter 3, "Radiological Training Program" (QUESTION 1)

- 35:** MN471016, Radiological Protection Procedures Manual, Chapter 10, "Radiation Generating Devices" (QUESTION 1)
- 36:** Corporate Procedure: ESH100.2.ELC.1, "Manage Electrical Hazards" (general corporate business process)
- 37:** Corporate Procedure: ESH100.2.IH.12, "Control Food and Beverage Consumption in Hazardous Areas" (general corporate business process)
- 38:** Corporate Procedure: ESH100.2.IH.17, "Address Indoor Air Quality Concerns" (general corporate business process)
- 39:** Corporate Procedure: ESH100.2.IH.21, "Control Ergonomics Hazards" (general corporate business process)
- 40:** Corporate Procedure: ESH100.2.IS.11, "Implement Housekeeping Safety" (general corporate business process)
- 41:** Corporate Procedure: ESH100.2.IS.7, "Implement Traffic Safety" (general corporate business process)
- 42:** Corporate Procedure: ESH100.3.1, "Prepare for and Manage Emergencies" (general corporate business process)
- 43:** Corporate Procedure: ESH100.4.RPT.2, "Report Injuries and Illnesses" (general corporate business process)
- 44:** Corporate Procedure: ESH100.5.RPT.5, "Report Vehicle Accidents and Property Damage" (general corporate business process)
- 45:** MN471001 - ES&H Manual, Section 4B, "Electrical Safety Practices" (general corporate business process)
- 46:** MN471001 - ES&H Manual, Section 4K, "Traffic Safety" (general corporate business process)
- 47:** MN471001, ES&H Manual, Section 21, "Technical Work Documents (TWDs)" (general corporate business process)

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	
City of Albuquerque - Wastewater Discharge Permit for CINT	2238A	Water	

NEPA Documents

Document Title	Number	Project End Date
CINT Integration Laboratories (1501, 1504, 1523, 1525, and 1527)	SNA07-0202	
CINT room 1511 - Integration Lab Parts Clean room	SNA08-0179	
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

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

Version of Questions:J

Version of Questions:Facility or Lab

Interview Worksheet

Questions Answers

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

RGDs								
Source 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							
E-beam Evaporator EG2	403	Exempt Shielded	Inherently Safe	10	Yes	No	Nogan,John	Yes
	Location: Site: SSTP, Area: N/A, Building: N/A, Room: N/A Location Details: SE corner							

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 (Do your activities include an Accelerator as defined in the Help Text; **Please read the help text, since this question has significantly changed.**) 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

	Questions	Answers
1c(2)	Radiation Area	No
1c(3)	High Radiation Area	No
1c(4)	Very High Radiation Area	No
1d	Are routine exposures <i>above</i> 100 <i>mrem</i> per year likely?	No
1e	Could a member of the public be exposed by the operation? (This usually involves portable or mobile radiography operations).	No
1f	Will there be radiological work in a <i>foreign country</i> or territory?	No
1g	Will the activity involve an RGD owned or operated by a party other than Sandia or Sandia's subcontractors?	No
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 <i>monitoring</i> instruments be used in this activity by MOW other than qualified Radiological Control Technicians?	No
1j	Will scrap metal generated from the project or activity come from a radiological area?	No
2	Radioactive Materials: Is radioactive material present?	No
3	Explosives and Ammunition: Are any explosives or ammunition (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: (Review the Help text before answering this question.) Do the activities involve chemicals?	Yes
5a	Has the Industrial Hygiene Program performed an exposure assessment of current activities conducted on Sandia-controlled premises involving chemicals that are covered by this PHS?	No
5b	Do any of the activities include? <ul style="list-style-type: none"> - 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
5d	(Review the help text before answering this question.) Do the activities involve storage or utilization of simple asphyxiants?	Yes
5d(1)	(Review the help text before answering this question.) Has an exposure assessment for potential oxygen deficient atmospheres involving the use of simple asphyxiants been performed?	Yes
5d(1)a	Did the exposure assessment indicate that there is a potential for an oxygen deficient atmosphere?	Yes
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

	Questions	Answers
5f	Do these activities involve working with 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
5h	Do activities involve any of the following? <ul style="list-style-type: none"> - 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 - Pyrophoric chemicals in total quantities greater than 500g - Metal powders in quantities greater than 1 kg 	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 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
5j	Do activities use or store toxic gases in quantities greater than the de minimus quantities listed in the Help file?	Yes
5j(1)	Do the activities use or store toxic gases in quantities equal to or greater than the threshold (total) quantities listed in the Help file?	No
5k	(Refer to help file to determine if quantities have been exceeded.) Do the activities use or store hazardous chemicals in quantities equal to or greater than the Emergency Management screening threshold quantities?	No
6	Electrical: Do workers conduct any of the following tasks? <ul style="list-style-type: none"> - Work on or near (within the limited approach boundary - 3.5 feet) exposed and energized (greater than or equal to 50 volts) electrical circuits or contact energized electrical circuit parts with tools or test probes? - Operate circuit breakers or disconnect switches operating at or above 50 Volts and 5 mA or more? - Perform non electrical work, but might contact exposed and energized electrical circuits - <i>operating at 50 volts or greater</i> - with equipment or materials, such as ladders, cranes, paint roller extensions, or forklifts? - Use Equipment that operates at 50 Volts or more and is not listed by an OSHA approved Nationally Recognized Testing Laboratory (e.g., UL) and operating at over 50 Volts, including extension cords and power strips? 	Yes
6a	Do workers work on or near (within the limited approach boundary - 3.5 feet) exposed and (greater than or equal to 50 volts) energized electrical circuits or contact energized electrical circuit parts with tools or test probes?	Yes

	Questions	Answers
6a(1)	Are circuit parts storing 10 Joules or more, associated with Marx generators or pulsed power circuits ?	No
6a(2)	Are circuit parts associated with facility type electrical distribution systems ?	No
6b	Do workers operate circuit breakers or disconnect switches operating at 50 Volts or more and 5 mA or more ?	No
6c	Do workers perform non electrical work , but might contact exposed and energized electrical circuits - <i>operating at 50 volts or more</i> - with equipment or materials, such as ladders, cranes, paint-roller extensions, or forklifts?	No
6d	Do workers use equipment that operates at 50 Volts or more and is not listed by an OSHA-approved Nationally Recognized Testing Laboratory (e.g., UL), including extension cords and power strips?	Yes
6d(1)	Have all of the non-NRTL approved electrical equipment or appliances been approved and documented using the Sandia non-NRTL-evaluation process?	Yes
Notes: If is discovered as being non-NRTL equipment, the electrical equipment or appliances will be approved and documented using the Sandia Non-NRTL evaluation process.		
7	Mechanical: Does the facility or activity involve any of the following hazards or activities? <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 workers operate machine shop equipment?	No
7b	Do workers operate portable power tools?	Yes
7c	Do workers 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 workers operate light or heavy earth moving equipment?	No

	Questions	Answers
7j	Do workers perform or come into close proximity to any of these activities: - Excavations - Trenches - Floor 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)?	Yes
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 workers involved in the design, installation, operation, or maintenance of a pressure system (including pressure, vacuum, cryogenic fluid applications)?	Yes

Pressure Hazards	
Source Name	Description
Ultra high vacuum systems	

	Questions	Answers
10a	Do personnel function as pressure system operators?	Yes
10b	Do personnel function as pressure installers?	Yes
10c	Do personnel 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

Questions	Answers
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
12 Miscellaneous Hazards: Does the facility or activity involve any of the following hazards or activities?	No
<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 - Firearms - Use of human subjects - Use of Sealed Drum(s) 	
13 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.	No
14 Non-Commercial Hazards: 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.	No
15 Environmental Concerns: Are there any potential environmental concerns with this activity that align with the SNL Environmental Management System (EMS) aspects, such as chemical use, fuel or oil storage, waste generation (except sanitary trash), construction activities, disturbance to habitat or protected species, or discharges to the air, ground surface, ground water, or the sewer systems?	Yes

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

Environmental Concerns Hazards		
Source Name	Type	Est. Quantity
Evaporated organic solvents	air	100 l/yr
Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A		
Hazardous Waste	liquid and solid	<100 kg/mo
Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A		
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		
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
15a(1)	General Discharges: Are the wastewater discharges of a general nature, such as the washing and rinsing of laboratory glassware and/or process components?	Yes
15a(2)	Categorical Processes: Are the wastewater discharges from a categorical process or does the activity contain a zero discharge categorical process?	No
15a(3)	Will this activity use more than 1,000 gallons of water per day?	No
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 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)	Less-Than-90-Day Accumulation Area: Will this activity store any hazardous waste in a less-than-90-day accumulation area ?	No
15d(2)	Acutely Hazardous Waste: Will this activity generate any acutely hazardous waste ?	No
15d(3)	Waste Containing Mercury: Will this activity generate any waste containing mercury (e.g., switches, thermometers, manometers, elemental mercury (Hg), or mercury compounds [e.g., mercuric oxide (HgO)], etc.)?	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	Radioactive Contamination: Will this activity be conducted in an area for which a reasonable potential exists for introducing radioactive contamination or causing activation of material that may become waste?	No
15h	Material or Waste of Unknown Origin: Will this activity require handling material or waste of unknown origin?	No
15i	Fuels and Oil Storage: Does this activity use a fuel or oil storage container capable of containing 55 gallons or more?	No
15j	Discharges to Ground Surface: Does this activity have a potential for any discharges to the ground surface ?	No
15k	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

Questions	Answers
15l 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 Packaging and Transportation of Hazardous Materials: Will any activities covered by this PHS involve the packaging and transportation of hazardous material (including explosives or radioactive material)?	No
17 Fire Protection Concerns: Will the activity include any of the following? <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. 	No
18 Biological Agents: (see Help text before answering this question.) Do activities involve the use of or potential exposure to biological agents?	No
19 Confined Spaces: Are confined spaces present in the work area?	No
20 Beryllium: Do operations include any activities that? <i>(Review the Help text before answering this question)</i> <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 Offsite Work: Does this PHS involve any of the following? <ul style="list-style-type: none"> - Work at non-Sandia-controlled premises - Work locations other than KAFB, SNL/CA, or TTR - Sandia supplying non-commercial equipment or hazardous material for use by non-Members of the Workforce at non-Sandia-controlled premises or locations other than KAFB, SNL/CA, or TTR. 	Yes
21a Are there any activities at the facility that are not conducted on Sandia-controlled premises? This includes work done by others, such as host-site personnel	No

Questions	Answers
<p>21b Does work performed by Members of the Workforce on non-Sandia-controlled premises or locations other than KAFB, SNL/CA, or TTR involve any of the following (as defined in the listed PHS questions)? Please include in the question notes a brief description of all hazards driving a "yes" answer to this question, including information about the activities associated with each hazard.</p> <ul style="list-style-type: none"> - radiation generating devices (question 1) - radioactive materials (question 2) - explosives (question 3) - lasers in navigable air space or affecting other operations (question 4b) - HAZWOPER operations (question 5b) - unbound engineered nanoparticles (question 5c) - newly developed chemical substance (question 5f) - chemical physical hazards (question 5h) - >25% PSM quantities (question 5i) - toxic gases (question 5j) - >Emergency Management screening quantities (question 5k) - personnel overexposure to nonionizing radiation (question 8a(1)) - public overexposure to nonionizing radiation (question 8b(1)) - non-routine aircraft (question 12g(1)) - airborne objects other than aircraft (e.g., projectiles, fragments) (question 12h) - firearms (question 12i) - equipment used outside of manufacturer's recommendations with the potential to cause injury to co-located workers or public (question 13b) <ul style="list-style-type: none"> - 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
<p>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.</p>	
21b(1) Has the SNL Safety Basis Department determined a hazard classification for these activities?	Yes
21b(1)a What hazard classification was determined by the SNL Safety Basis Department?	Low

	Questions	Answers
21c	<p>Does Sandia supply any of the following for use by non-Members of the Workforce on non-Sandia-controlled premises or locations other than KAFB, SNL/CA, and TTR? Please include in the question notes a brief description of all hazards driving a "yes" answer to this question, including information about the activities associated with each hazard.</p> <ul style="list-style-type: none"> - radiation generating devices - radioactive material - explosives - Class 3b or Class 4 lasers where beam will be used outside - chemicals - aircraft - projectiles or objects that could become airborne as a result of the work - nonionizing radiation transmitters other than hand-held radios or Local Area Network (LAN) equipment. - equipment used outside of manufacturer recommendations, including modified equipment - non-commercial equipment, including custom-built equipment - biological agents BSL-2 or higher 	No
21d	Do these activities involve foreign travel?	No
22	Roving Personnel: Will any work covered by this PHS be conducted by Roving Personnel in a Sandia, non-office area (e.g. working in another organization's space)?	No
23	Emergency Response: Do activities include ES&H emergency response operations, (e.g., NEST, ARG, Hazmat, Medical)?	No
24	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: 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 the activities on Sandia-controlled Premises?	Yes
C2a(1)	Did the workplace hazard assessment determine that personal protective equipment will be required?	Yes
C2a(1)a	Has the workplace hazard assessment determined respiratory protection is required?	Yes
C2a(2)	Does the workplace hazard assessment allow voluntary use of respiratory protection?	Yes
C2a(2)a	Would voluntary use of respiratory protection be ONLY filtering face pieces (i.e., dust masks)?	Yes

Questions	Answers
C3 Control of Hazardous Energy (LOTO): Do you have any equipment in your operations that requires any of the following activities?	Yes
<ul style="list-style-type: none"> - Construction - Installation - Setup - Adjustment - Inspection - Modification - Maintenance - Service - Lubrication - Cleaning - Unjamming - Making adjustments or tool changes 	
C3a While performing the servicing and maintenance activities identified above, is there potential for injury from the unexpected energization or start up of the machines, equipment, or process 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 the 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 the 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
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?	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 5j(1)
Source Reason: Toxic gasses
Hazardous Condition: Inhalation / Potential for environmental release

PHS Identified 'Low' Hazard.

Author's Comment: The gases of concern are Ammonia (9 lb), Chlorine (1 lb), Boron Trichloride (1 lb), Silane (8 lbs), Dichlorosilane (8 lbs) and Phosphine SDS (15g). All are contained within gas cabinets are are designed to shut down upon the detection of any leaks. The Phosphine gas is absorbed into a carbon media for the purpose of creating a slow 0.02mg/min desorption limited release.

Cause: System/Component/Equipment Failure

The valve on the cylinder fails causing a leak.

Consequence: Major Illness/Injury

Personnel exposure to gases.

Mitigation: Active Engineering Control-Other

The system is designed to shut off the gas if it were detected within the gas cabinet.

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

Document Id: OP1100.189, **Title:** Operating Procedure for Toxic/Pyrophoric/Inert Gas Cylinders Change-Out

Mitigation: Warning Device-Audible Alarm (horn/bell/whistle)

A high level alarm will activate upon the detection of a leak at 3 times the Threshold Limit Value. This notification alerts personnel to evacuate the building.

Mitigation: Training-Other

Personnel have site specific training for integration lab activities and are aware of the hazards and what to do in case of an emergency.

Mitigation: Training-Other

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

Adequacy Explanation: The design of the cabinet to shut off the gas when detected from a leak, the procedure and training received are adequate controls for this hazard.

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 5d(1)a
Source Reason: Asphyxiant gases
Hazardous Condition: Illness / Asphyxiation

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

Cause: System/Component/Equipment Failure

Release of asphyxiant due to equipment failure

Consequence: Death [Worker]

Release of a significant amount of asphyxiant gas in the IL (especially in the event of an air handling system failure) can lead to death in the extreme case.

Mitigation: Warning Device-Audible Alarm (horn/bell/whistle)

Oxygen monitors are active in the IL and alert users to a deficient atmosphere, prompting an evacuation.

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

Adequacy Explanation: Oxygen monitors, when properly maintained, are highly effective in detecting an oxygen deficient atmosphere and preventing asphyxiation.

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 21b(1)a
Source Reason: Low-Level Offsite Hazardous Work Condition
Hazardous Condition: Potential for worker and co-located worker exposure

PHS Identified 'Low' Hazard.

Author's Comment:

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.

Cause: System/Component/Equipment Failure

The valve on the cylinder fails causing a leak.

Consequence: Major Illness/Injury

Personnel exposure to gases.

Mitigation: Active Engineering Control-Other

The system is designed to shut off the gas if it were detected within the gas cabinet.

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

Document Id: OP1100.189, **Title:** Operating Procedure for Toxic/Pyrophoric/Inert Gas Cylinders Change-Out

Mitigation: Warning Device-Audible Alarm (horn/bell/whistle)

A high level alarm will activate upon the detection of a leak at 3 times the Threshold Limit Value. This notification alerts personnel to evacuate the building.

Mitigation: Training-Other

Personnel have site specific training for integration lab activities and are aware of the hazards and what to do in case of an emergency.

Mitigation: Training-Other

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

Adequacy Explanation: The design of the cabinet to shut off the gas when detected from a leak, the procedure and training received are adequate controls for this hazard.

Note: 26 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 6d(1) - If is discovered as being non-NRTL equipment, the electrical equipment or appliances will be approved and documented using the Sandia Non-NRTL evaluation process.

Q 8a - See ALD Hazard Assessment Survey Report SNLNM02066.

Q 15 - This facility will generate less than 100 kg/month of hazardous waste.

Q 21b - 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

Environmental Concerns Hazards		
Source Name	Type	Est. Quantity
Evaporated organic solvents	air	100 l/yr
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A	
Hazardous Waste	liquid and solid	<100 kg/mo
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A	
	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 Comments: There will be water discharged to the sanitary sewer from the acid neutralizer system.	

Pressure Hazards	
Source Name	Description
Ultra high vacuum systems	

RGDs								
Source 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								
E-beam Evaporator EG2	403	Exempt Shielded	Inherently Safe	10	Yes	No	Nogan,John	Yes
Location: Site: SSTP, Area: N/A, Building: N/A, Room: N/A Location Details: SE corner								

Assigned Reviewers

Review Type	Role	Person	Required/Requested
Technical SME	ISMS_IFSBReviewer	Stirrup,Timothy Scott	Required Review, due to: QUESTION 21b(1)
	Required Assignment: Review Question 21 and hazard-specific question sets that relate to the user-specified hazards identified in Question 21		
	Comment: [tss 07132011] IFSB review Q#21b for MOW activities performed at locations other than "KAFB, SNL/CA, or TTR" for offsite CINT location with following listed hazards: RGD, nanoparticles, reactive chemicals, and de minimis quantity toxic gases. CINT DHA and HARP support low hazard classification.		
ES&H Coordinator	ISMS_ESH_Coordinator	Davis,M. Wayne	Required Review by business rule.
Safety Basis Manager	ISMS_RiskManagerA	Hall,Christopher Armando	Required Review by business rule.
	ISMS_Manager	Hearne,Sean J.	Required Review by business rule.

PHS Output

Major Safety Concerns

The hazard classification is: Low

The required documentation is: PHS with integral HA

Safety Concerns at this Low level include:

(QUESTION 5a) Potential chemical overexposure

(QUESTION 5d(1)a) Asphyxiant gas; Potential injury or death from unevaluated asphyxiant gas displacing oxygen in a workspace.

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

(QUESTION 5j(1)) Potential exposure to toxic gasses in the event of a release

(QUESTION 21b(1)a) Hazards encountered while conducting work offsite by members of the workforce

Other Safety Concerns

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

(general corporate business process) Traffic related hazards for injury

(general corporate business process) Roving Personnel or Visitors entering work area

(general corporate business process) Common electrical hazards

(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 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 6a) Potential electrical shock or arc

(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 15a(1)) Potential to exceed permitted amounts

(QUESTION 15b) Potential to emit regulated contaminants

(QUESTION 15d) Potential for regulatory action

(QUESTION 21a) Hazards associated with the site's other activities

(QUESTION 21d) Hazards associated with domestic travel

(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 (QUESTION 5)

CHM103: SITE-SPECIFIC CHEMICAL SAFETY TRAINING (QUESTION C2a(1))

CHM103: SITE-SPECIFIC CHEMICAL SAFETY TRAINING (QUESTION 5)

ELC106: R&D ELECTRICAL SAFETY (> 50 VOLTS) (QUESTION 6a(2))

ELC106R: R&D ELECTRICAL SAFETY REFRESHER (> 50 VOLTS) (QUESTION 6a(2))

ENV112: HAZARDOUS WASTE & ENVIRONMENTAL MANAGEMENT TRAINING (QUESTION 15d)

ESH100: ES&H AWARENESS (general corporate business process)

ESH200: SAFETY MANAGEMENT (general corporate business process)

LTO210: LOCKOUT/TAGOUT FOR AUTHORIZED WORKERS (QUESTION C3a(1)b)

LTO220: ANNUAL LOCKOUT/TAGOUT (LOTO) ROLES & RESPONSIBILITIES FOR AUTHORIZED WORKERS (QUESTION C3a(1)b)

LTO220: ANNUAL LOCKOUT/TAGOUT (LOTO) ROLES & RESPONSIBILITIES FOR AUTHORIZED WORKERS (QUESTION C3a(1)a)

MCH200: HAND AND POWER TOOL SAFETY (QUESTION 7b)

MED105HF: HYDROFLUORIC ACID SAFETY (QUESTION 5e(1))

NANO101: NANOTECHNOLOGY SAFETY AWARENESS TRAINING (QUESTION 5c)

PPE106: PERSONAL PROTECTIVE EQUIPMENT TRAINING (QUESTION C2a(1))

PRS115: CRYOGEN SAFETY (QUESTION 10c)

PRS115R: CRYOGEN SAFETY REFRESHER (QUESTION 10c)

PRS150: PRESSURE SAFETY ORIENTATION (QUESTION 10a)

PRS150: PRESSURE SAFETY ORIENTATION (QUESTION 10b)

PRS150R: PRESSURE SAFETY ORIENTATION REFRESHER (QUESTION 10b)

PRS150R: PRESSURE SAFETY ORIENTATION REFRESHER (QUESTION 10a)

PRS250: ADVANCED PRESSURE SAFETY (QUESTION 10b)

PRS250R: ADVANCED PRESSURE SAFETY REFRESHER (QUESTION 10b)

RAD102: GENERAL EMPLOYEE RADIOLOGICAL TRAINING (QUESTION 1b(1))

RAD219: RADIATION-GENERATING DEVICE CUSTODIAN TRAINING (QUESTION 1)

RAD250: MANAGEMENT OF RADIOLOGICAL OPERATIONS (QUESTION 1)

RSP215: AIR-PURIFYING RESPIRATORY PROTECTION (QUESTION C2a(1)a)

RSP217: COMPREHENSIVE RESPIRATORY PROTECTION (QUESTION C2a(1)a)

RSP230: RESPIRATORY PROTECTION FOR SUPERVISORS (QUESTION C2a(1)a)

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 5d(1)a answered: Y; Q 5e answered: Y; Q 5e(1) answered: Y;
Q 5g answered: Y; Q 5h answered: Y; Q 5h(1)a answered: N; Q 5j(1) answered: N; Q 6a answered: Y;
Q 6a(2) answered: N; 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 15a(1) answered: Y; Q 15b answered: Y; Q 15d answered: Y; Q 21a answered: N;
Q 21b(1) answered: Y; Q 21b(1)a answered: Low; Q 21d answered: N; Q C1 answered: Y; Q C2 answered: Y;
Q C2a(1) answered: Y; Q C2a(1)a answered: Y; Q C3 answered: Y; Q C3a(1)a answered: N; Q C3a(1)b
answered: N;
Q C4 answered: Y;

X. Emergency Operations Concerns

Energized Systems - RGD

Pressure

Environmental Concerns

Chemical

Energized Electrical

Energized Mechanical

Non-ionizing Radiation

Other Hazard