INTEGRATED WORK DOCUMENT

IWD#: LANSCE-NS- 06-02 Version#: 4			Activity/Task Title: Flight Path 4FP30R (FIGARO and NZ) Neutron Beam Experiments at LANSCE/WNR
TA: 53	Building: MPF-29	Room: 101	Additional Location Description: Inside the 4FP30R RSS boundary

Activity Description/Overview

Irradiation of samples/materials on WNR Target 4 neutron flight path 4FP30R (FIGARO and NZ) for experimental science goals, and operation of associated detector systems.

Work Tasks/Steps	Hazards, Concerns, and Potential Accidents/Incidents	Controls, Preventive Measures, and Bounding Conditions	Reference Documents	Training

General training requirements for all flight path user experiments at WNR Flight Path 4FP30R				For non-LANL users:
				- TA-53 User Facility Specific Training (39486)
				- TA-53 Rad Worker Practical (24856)
				- Rad Worker Exam (12909)
				- TA53 Building Emergency Plan Program, MPF-29 (31744)
				
				For LANL workers:
				- TA-53 Employees/Residents Training Plan (201)
				  - TA53 Facility Specific Training (34095)
				  - Building Emergency Plan, MPF-29 (31744)
				  - TA53 Waste Awareness (22162)
				- Radiological Worker II Training Requirements (Plan 115)
				  - Rad Worker II Classroom (20301)
				  - Rad Worker Practical (12910)
				  - Rad Worker Exam (12909)

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Flight Path Scientist or designated alternate must provide orientation to all flight path users at least annually. This orientation includes the following: - Completion of LANSCE-NS User Checklist. - Pre-job briefing on this IWD. - Completion of user OJT on the EPACS for the flight path. - Signatures on the OJT Record of Completion.			- WNR User Checklist - Record of Completion of On-the-Job Training for User Orientation at WNR Flight Path - Experiment-specific LANSCE Safety Review Worksheet - AOM 6.05.72: 4FP30R Flight Path Area Sweep and Entry Procedures	- Flight Path 4FP30R Orientation and OJT (43037)
Flight Path Activity: 1. Irradiate samples in neutron beam for experiments	1. Potential exposure to ionizing radiation when beam is on and shutter open. 2. Potential exposure to radiation from materials activated by the neutron beam.	1. a. The Experiment Personnel Access Control System (EPACS) exclusion area must be secured before the shutter can be opened. b. Shielding around instrument and flight path results in radiation levels outside of EPACS boundary that are below posted levels. c. Radiation Security System (RSS) system ensures beam delivery ceases immediately if EPACS boundary is broken with shutter open. d. TLD and PN-3 dosimeters required. 2. a. Anticipated radiation levels due to		See general training requirements

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	3. Potential exposure to high-voltage bias on photomultiplier tubes.	activation are analyzed during the experiment safety review. b. All materials in the EPACS boundary must be monitored and tagged prior to release. Materials not surveyed by a Health Physics RCT should be labeled with a "Possibly Radioactive" sticker, and stored in a radiological controlled area. 3. a. All high voltage connectors and cables are rated for the voltage applied and designed to minimize the likelihood of unintentional contact. b. Only low current power supplies are used (<40 mA). Corresponds to Class 2.1d (green). c. Power supplies are turned off prior to disconnecting high voltage connections.		
Flight Path Activity: 2. Changes to beam collimation and filtering.	1. Beamline has a thin window that could be punctured or rupture, possibly resulting in damage to hearing. 2. Potential exposure to radiation from activated beamline components. 3. Potential abrasion, crush, pinch, or ergonomic injury from handling or dropping heavy collimator components.	1. a. Beamline vacuum must be vented prior to changes in collimation. b. Extra care should be taken when working in the vicinity of thin windows. 2. Beamline components exposed to the neutron beam in the vicinity of the work must be surveyed prior to the start of activity, except for (a) steel collimators outside the neutron shutter, (b) lead, poly and borated poly beam filters. 3. Hard-toed shoes and work gloves when handling large collimator components. 4. Personnel are limited to lifting less than		See general training requirements

Work Tasks/Steps	Hazards, Concerns, and Potential Accidents/Incidents	Controls, Preventive Measures, and Bounding Conditions	Reference Documents	Training
		50 lbs individually. Use good lifting technique by lifting with legs, not the back.		
Flight Path Activity: 3. Sample exchange in the (n,z) experiment vacuum chamber.	1. Vacuum chamber has a thin window that could be punctured or rupture, which may cause damage to hearing. 2. Potential for exposure to radiation and contamination from casual contact with the Th-228/229 source in vacuum chamber.	1. Care must be taken when working in the vicinity of the vacuum chamber and thin window. 2. When working in the vacuum chamber, care must be taken to avoid contact with the thorium source.		See general training requirements
Flight Path Activity: 4. Monitor neutron flux using a fission ionization chamber. Note: All activity involving troubleshooting, servicing, or maintaining fission ionization chambers is beyond the scope of this IWD. See LANSCE-NS-24, "Operations of Fission Flux Monitors at LANSCE"	1. Chamber has a thin window that could be punctured or rupture. Window is under pressure up to 15 psig from P-10 gas. 2. If thin window is punctured, potential exposure to and inhalation/ingestion of radioactive ^{235}U and/or ^{238}U material. 3. If thin window ruptures suddenly, potential hearing damage due to puncture of thin windows.	1. Quantity of radioactive material is less than 300 mg and fully contained within instrument under normal operating conditions. 2. Thin windows should be protected by covers when not in use or anytime work near the chamber is necessary. Take reasonable precaution to avoid puncturing windows when instrument is operating. Call an RCT if window is breached.		See general training requirements

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Cryogen Usage: 1. Hand filling of dewars, detectors, and experimental equipment with liquid nitrogen.	1. Potential for asphyxiation due to release of excessive nitrogen into the room. 2. Potential for cryogenic burns. 3. Potential for enhanced flammability or explosion due to oxygen condensing on liquid nitrogen temperature surfaces.	1. Oxygen sensors monitor oxygen levels and low oxygen alarms sound if levels fall below safe levels in MPF-29. 2. Safety glasses, face shield, and insulated gloves are required when handling components that might contain liquid nitrogen, when handling open dewars of liquid nitrogen, or when filling dewars or detectors with liquid nitrogen. Pants with no cuffs should be worn when working with cryogens. No open toed shoes may be worn when working with cryogens. 3. Combustible materials should be avoided in the vicinity of components that may be at cryogenic temperatures.		- Cryogenic Fluids Worker (Plan 2720) - Cryogen Safety (8876) - Chemical Hazard Comm. (25418)
Lead & Cadmium Use: 1. Use of lead and cadmium shielding with no modification	1. Potential risk of ingesting lead and cadmium through casual contact.	1. Area is posted as a "Lead & Cadmium Use Area." No food or drink is permitted in area.		See general training requirements

Work Tasks/Steps	Hazards, Concerns, and Potential Accidents/Incidents	Controls, Preventive Measures, and Bounding Conditions	Reference Documents	Training
Lead & Cadmium Use: 2. Rearranging experiment-specific, hand-stacked lead shielding or cadmium components (Limited to minor hand stacked experiment shielding changes)	1. Potential risk of ingesting lead and cadmium through contact or inhalation of dust. 2. Potential crush hazard if lead bricks are dropped. 3. Potential for ergonomic injury from improper lifting technique or lifting excessive weight.	1. Area is posted as a "Lead & Cadmium Use Area." No food or drink is permitted in area. Gloves must be worn when handling lead and/or cadmium. 2. Hard-toed shoes required when moving lead bricks or other heavy components. 3. Polymer gloves (nitrile, etc.) required to prevent exposure through handling. 4. Leather, or similar, work gloves required when handling heavy bricks or other components that may damage polymer gloves under normal conditions. Work gloves must be labeled "For Lead and Cadmium Use Only" and stored in a sealed plastic container or bag when not in use. 5. Personnel are limited to lifting less than 50 lbs individually. Use good lifting technique by lifting with legs, not the back.		- Lead Exposure Below the Action Level (Plan 3675) - Lead Awareness (4426) - Chemical Hazard Comm. (25418) For Cadmium Handling: - Cadmium Training (Plan 8814) - Cadmium Awareness Self-Study (40693)
Waste generation and control	1. Potential for unnecessary waste generation 2. Potential for low hazard waste being mixed with higher hazard waste resulting in unnecessary quantities of higher level waste generation	1. Waste will be segregated as "clean", low-level radioactive, hazardous, or mixed hazardous waste as appropriate. 2. If production of hazardous or mixed waste is identified in the safety review, additional training and work control will be required in the experiment specific IWD. 3. Coordinate generation and disposal of hazardous and mixed waste generation with Waste Coordinator.	P 409 Waste Management	See general training requirements
Experiment specific tasks	To be identified through the Experiment Safety and Technical Review Process	As specified in experiment specific IWD, if any		As required by experiment specific IWD

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HAZARD GRADING AND PIC ASSIGNMENTS

Hazard Grading	
☐ Low-hazard ☒ Moderate-hazard ☐ High-hazard/complex	Primary PIC Bob Haight
	Alternate PIC
	Alternate PIC
☒ Standing	Alternate PIC

HAZARD ANALYSIS, SUBJECT MATTER EXPERT AND PEER REVIEW

Date Hazard Analysis Completed:			Attach list of additional participants, if necessary	
Subject Matter	Name (mark N/A where not applicable)	Z#	Date	Signature
Health Physics	Mike Duran	106440	5/26/10	Mike Duran
Industrial Hygiene	Mark Mullis	238137	5/21/2010	Mark Mullis
Laser Safety	N/A			
Electrical Safety	Charles Alexander	194347	5/21/10	[illegible]
Waste Management	Lance Kloefkorn	117583	5-20-10	[illegible]
Classification	N/A			
Peer	Howard Nekimken	100052	6/1/10	Howard Nekimken

RESPONSIBLE LINE MANAGER REVIEW AND AUTHORIZATION

The RLM and FOD or Representative approve work based upon confidence that this IWD has been properly prepared, that the work will be performed within ES&H/S&S requirements, facility requirements and capabilities, and will be performed in accordance with this IWD.	FOD (Signature/Z#/Date)	[illegible] 111476 7 June 2010
	RLM (Signature/Z#/Date)	[illegible] 100101 6/3/10
	Date approval valid through:	6/2/11

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FOD must determine the facility entry and coordination requirements and identify the ES&H/S&S hazards and controls associated with the activity location.

FOD Designated Facility Point-of-Contact	Name	Phone	Pager	Email
	Leo Bitteker	667-0333	664-7996	lbj@lanl.gov

Entry and Coordination Requirements (Check one or more of the following)

- ☐ No entry/coordination requirements
- ☐ POTD/POTW
- ☒ Work must be scheduled
- ☐ Co-located Hazards/Concerns
- ☐ Review under AB/Safety Basis/USQ
- ☐ FOD designated facility point-of-contact must sign IWD Part 3
- ☐ Check in at Start of Work
- ☐ Check in Daily
- ☐ Check out at End of Work
- ☐ Check out Daily
- ☒ Work-Area Training Required
- ☐ Escort Required
- ☐ Quality Issues
- ☐ Other Bounding Conditions:
- ☐ Security Clearance Requirements
- ☐ Other Security Requirements

Instructions: In the block below, provide facility or work-area information needed by the workers on this activity. (Things to consider include specific work-area hazards and controls, potential conflicts with co-located activities, or any facility restrictions on the activity.) Identify relevant reference documents and any training required.

FACILITY/WORK-AREA INFORMATION RELEVANT TO THIS ACTIVITY

Reference Documents	
Training Requirements	

FACILITY OPERATIONS DIRECTOR APPROVAL

The FOD approves work based upon confidence that the IWM process has been applied appropriately, and approves this activity to be performed in the FOD's facility.	**FOD** (Signature/Z#/Date) 111476 7 June 2010

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Pre-Job Brief Content

- What are the critical steps or phases of this activity?
- How can we make a mistake at that point?
- What is the worst thing that can go wrong?
- What controls, preventive measures, and bounding conditions are needed?
- What work permits are required and how will we meet their requirements?
- What are the handoffs and coordination requirements among workers and multiple PICs?
- Are there hold-points including those that require sign-offs?
- What are the stop work responsibilities and expectations (e.g. for unanticipated conditions or hazards)?
- How would we respond to alarms and emergencies?
- Are there lessons learned from previous similar work?
- Is other information needed to perform this activity in a safe, secure, and environmentally responsible manner?
- Does everyone agree to the work tasks/steps, hazards, and controls and commit to follow them?

FOD WORK RELEASE	
By signing, I verify this activity is compatible with current facility configuration and operating conditions **If required by FOD in Part 2.**	**FOD Designee** (Signature/Z#/Date) **Date approval expires:**
PERSON IN CHARGE WORK RELEASE	
By signing, I have verified the following: • I have verified authorization by ensuring approval signatures of the RLM and FOD. • I have jointly conducted a walkdown with workers to confirm the IWD can be performed as written, required initial conditions and other prerequisites are in-place. • The assigned workers are authorized and are qualified to perform the work in a safe, secure, and environmentally responsible manner. • I have conducted the pre-job briefing, and all workers have been briefed. • I have ensured coordination with any required FOD work-area representatives (e.g., area work coordinators).	**PIC** (Signature/Z#/Date)
Alternate PIC Signatures **Required** when PIC authority is assumed the first time (Note: alternate PICs are required to sign only once, but formal handoff and employee notification are required for each PIC change).	**Alt. PIC** **Alt. PIC** **Alt. PIC**

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PRE-JOB BRIEF ATTENDANCE ROSTER

By signing below, I agree to the following:

- I agree to follow the work steps and implement the controls as written.
- I agree to stop work when conditions or hazards change or when I encounter unexpected conditions during the execution of work, or when work cannot be performed as written, or instructions become unclear during execution.
- I confirm that I am authorized, qualified, and fit to perform the work.

Worker Name (print)	**Z#**	**Date**	**Signature**