



Argonne
NATIONAL
LABORATORY

... for a brighter future



U.S. Department
of Energy



A U.S. Department of Energy laboratory
managed by The University of Chicago

APS Experiment Safety Assessment Form System and ISM

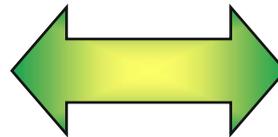
Bruce Glagola

APS User Safety Officer

June 6, 2008

ESAF and ISM

APS User Experiment Safety & Integrated Safety Management



What is ISM?

- ISM (Integrated Safety Management) is founded on [seven principles](#) and [five core functions](#). There are two pieces of ISM. One is the **integration of all the elements of safety**. The second is the **incorporation of safety into all work**. Working safely should be a natural part of working, not just something “the safety people do.”

Why ISM?

- DOE mandates ISM within our prime contract
- ISM is a highly effective and efficient approach to safety
- ISM provides a framework for compliance with other regulatory requirements
 - 10 CFR 851 Worker Safety and Health (WSH) Program
 - Price-Anderson Amendments Act (PAAA)
 - Environmental Management System (EMS)

When Were ESAF and ISM Joined Together?

- At the first design stages in 1997.

ISM Core Functions

Core functions of ISM detail a **common sense process** to establish and ensure safety in the workplace.

Core Function	What Does it Mean?
Define scope of work	<ul style="list-style-type: none"> - What is my job assignment and know how to do it? - Do I have the equipment I need? - Do I need help or any kind of assistance?
Analyze hazards	<ul style="list-style-type: none"> - What are the hazards of this job? - Has this job been reviewed by someone who is qualified? - Does it need to be reviewed? - What can go wrong? -
Develop/Implement hazard controls	<ul style="list-style-type: none"> -Do I know what the controls are and how to use them? - Do I know what to do if something goes wrong? - Are the necessary controls in place? (LO/TO, PPE, support personnel, etc.) - Do I need a permit?
Perform work within controls	<ul style="list-style-type: none"> - Did the job go as I expected? - Who And when do I call for help? - When do I use “stop work” authority? - Do changes in what I am doing need further review?
Feedback and improvement	<ul style="list-style-type: none"> - Was the job adequately planned? - Were there any surprises? - Can we do this job better? - Did I notice any problems/anything that needs attention? - Was I properly trained for the job? - What would make it better next time?

ISM Allows for a Graded Approach

■ Low Risk

APS - Experiment Safety Assessment Form

[Main Menu](#) | [Search Criteria](#) | [Instructions](#) | [Logout](#)

General | Experimenters | Description | Materials | Equipment | Electrical Inspection | Requirements | Comments Summary | Beamline Admin | APS Admin

Status : Pending (Glagola)	PEN : 28-IDC-2007-	Role : APS ESRB
----------------------------	--------------------	-----------------

■ Higher Risk

APS - Experiment Safety Assessment Form

[Main Menu](#) | [Search Criteria](#) | [Instructions](#) | [Logout](#)

General | Experimenters | Description | Materials | Equipment | Electrical Inspection | Lab Use | Human Materials | Radioactive Samples | Requirements | Comments Summary | Beamline Admin | APS Admin

Status : Pending (User)	PEN : 28-ID-2007-	Role : APS ESRB
-------------------------	-------------------	-----------------

NOTE : No experiment will be allowed to run until a properly completed and approved experiment safety assessment form has been posted by an APS Floor Coordinator

Define Scope of Work

User Submits Proposal and ESAF Defining Hazards of Experiment

■ Description of Work

<p>Attached Files (the limit length of a file name is 60 characters.) aluminum.pdf Cu MSDS.pdf IMR SR PB Single 20Base 20Smokeless.pdf Index Matching Liquid Carille Labs .pdf MSDS Hoppes No 9 Solvent.pdf 0.5 inchPGSafetyv4.pdf lithium fluoride MSDS.pdf msds quartz.pdf P47 Phosphor MSDS.html Vitreous Carbon.pdf epon resin 815c MSDS.pdf MSDS CCI Primer.pdf Hysol HD3475 Epoxy Hardener.pdf</p>	<p>Please supply a <u>short</u> description of the details of the proposed experiment, including sample and proposed hazard controls (engineered and administrative). You may also attach PDF or Word Documents Note: the limit length of a file name is 60 characters. Attach PDF or Word Documents</p> <p>We will be performing x-ray diffraction on shock compressed single crystals using diffraction from a single x-ray bunch of approximately 8.8keV energy. A launcher will accelerate a cylindrical aluminum projectile to a velocity nominally below 700m/s which will then impact the target of interest. Operation details of the launcher are provided in an attached SOP document. The targets will consist of a quartz buffer, the sample of interest, and for some of the targets a vitreous carbon x-ray window backing the sample. The samples to be examined are <u>LiF</u>, Al, and Cu single crystals. In order to synchronize the</p>
---	---

Define Scope of Work

- List all Samples and Materials to be Used
 - Include Materials Used for Prep Work in Lab
- Provides for Identifying Hazards with Each Material
- Identifies Materials to be put in Argonne Waste Stream
- Identifies Need for Laboratory Use

Materials Information												
Delete	Name	Quantity	CAS #	Any Hazards	Toxic	Biohazard	Flammable	Radioactive	Carcinogen	Corrosive	Oxidizer	Other
<input type="checkbox"/>	Aluminum Single Crystal	~1gm	7429-90	N	N	N	N	N	N	N	N	N
<input type="checkbox"/>	Copper Single Crystal (s	~3.5gm	07440-1	N	N	N	N	N	N	N	N	N
<input type="checkbox"/>	Epon Resin 815c (bisph	9lb cor		Y	Y	N	Y	N	N	N	N	N
<input type="checkbox"/>	Hoppe's No. 9 Powder S	1 quart		Y	Y	N	Y	N	N	N	N	N
<input type="checkbox"/>	Hysol HD3475 epoxy ha	2.2lb ca		Y	Y	N	Y	N	N	Y	N	N
<input type="checkbox"/>	Index Matching Liquid (C	a few c		Y	N	N	Y	N	N	N	N	N
<input type="checkbox"/>	Lithium Fluoride Single C	~3gm	7789-24	N	N	N	N	N	N	N	N	N
<input type="checkbox"/>	P47 Phosphor (x-ray phc	~300m	100403	N	N	N	N	N	N	N	N	N
<input type="checkbox"/>	Quartz Single Crystal	~10gm	14808-4	N	N	N	N	N	N	N	N	N
<input type="checkbox"/>	Vitreous Carbon	~1gm		N	N	N	N	N	N	N	N	N
<input type="checkbox"/>	acetone	a few c	67-64-1	Y	Y	N	Y	N	N	N	N	N
<input type="checkbox"/>	isopropanol	a few c	67-63-0	Y	Y	N	Y	N	N	N	N	N
<input type="checkbox"/>	methanol	a few c	67-56-1	Y	Y	N	Y	N	N	N	N	N
<input type="checkbox"/>	rifle cartridges empty wit	<44		Y	Y	N	Y	N	N	N	Y	Y
<input type="checkbox"/>	single base smokeless	<160g		Y	Y	N	Y	N	N	N	N	Y

Define Scope of Work

- Identifies Equipment that will be Used

Bringing to APS		Equipment Information	
<input type="checkbox"/>	<input type="checkbox"/> Cryogenics (system or cryogen not normally a part of the beamline operation)		
<input checked="" type="checkbox"/>	High Temperature	<input type="checkbox"/> Electric Furnace	<input type="checkbox"/> Optical Furnace
<input type="checkbox"/>	High Pressure	<input type="checkbox"/> Diamond Anvil Cell	<input type="checkbox"/> Large Volume
<input checked="" type="checkbox"/>	Laser	<input checked="" type="checkbox"/> Class 2	<input checked="" type="checkbox"/> Class 3a
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> High Voltage		
<input type="checkbox"/>	<input type="checkbox"/> Magnetic Field		
<input type="checkbox"/>	<input type="checkbox"/> RF or Microwave		
<input type="checkbox"/>	<input type="checkbox"/> X-Ray Generator (does not include the APS Storage Ring)		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Electrical Equipment		

Analyze Hazards

- APS Safety Committees in Administrative Roles
- Direct Access to ESAF for Select Hazard Classes
- Can View and Add Comments
- Cannot Approve ESAF
- Radioactive Materials
 - Access by APS Radioactive Sample Safety Review Committee
- Biohazards and Human Materials
 - Argonne Institutional Biosafety Committee Chair

Status : Approved (Rice)		PEN : 18-IDD-2007-37		Role : APS ESR	
APS Safety Committee Comments (CONFIDENTIAL)					
APS Verifier		51595-07/11/2007	Laurel Vana has received BBP refresher training and BSC training.		
John Vacca / RSO-HP a		51595-07/11/2007	This protocol was approved by the IBC as application no. 2006-0009 on 1/10/2007 under BSL2+ containment. Annual updates will maintain protocol validity for a total of three years. Sector staff and user group have obtained bloodborne pathogen training, agent-specific training and informational training regarding the operational components of BSL2+ containment. Eye wash, sink and biosafety cabinet required as adjunct equipment. BSC training required for both user group and sector staff on the APS BSC. Solid waste must be disposed of by Waste Management as regulated medical waste via incineration. Both approved protocol and emergency response information must be kept posted for the duration of the containment period. The APS BSO must inspect the sector prior to the initiation of BSL2+ containment. Biohazardous material must be kept locked up at all times when not in use and properly labelled.		
APS Experiment Review Board					
Approver Name : MOONIER, NENA		51595-07/11/2007	51595-02/28/2007 Attached in the description section is the IBC memo, Sarah Rice's application, Calling tree response/Contact list, and copies of the training received by the users and Beamline staff.		
Date : 07/11/2007		51595-07/11/2007	Users have received BBP training and prion awareness training from the ANL BSO. Beamline staff has received Biohazard awareness training and prion awareness training from the ANLBSO. All users have received BSC training from the APS BSO		
Status : <input type="button" value="Approved"/>		51595-07/11/2007	Rad samples are to be mailed to bldg 46 where they will be brought to Bldg 435 by SPM with Health Physics present. ALL users are in the process of obtaining ESH700 training.		
Contact sector coordinator					
Risk Class : High					
APS Risk Class : <input type="button" value="High"/>					
Beamline Approver					
Approval Status : Approved					
Approval Date : 07/12/2007					
APS Comments (Posted at Experiment)					
		29872-07/09/2007	Uranium use and containment reviewed and approved by RSO-HP. All required runtime controls and procedures for radioactivity will be implemented by RSO-HP.		
		29872-07/09/2007	Nena Moonier and John Vacca both have to signoff on this experiment at posting time for the APS.		
		51595-07/11/2007	This protocol was approved by the IBC as application no. 2006-0009 on 1/10/2007 under BSL2+ containment. Annual updates will maintain protocol validity for a total of three years. Sector staff and user group have obtained bloodborne pathogen training, agent-specific training and informational training regarding the operational components of BSL2+ containment. Eye wash, sink and biosafety cabinet required as adjunct equipment. BSC training required for both user group and sector staff on the APS BSC. Solid waste must be disposed of by Waste Management as regulated medical waste via incineration. Both approved protocol and emergency response information must be kept posted for the duration of the containment period. The APS BSO must inspect the sector prior to the initiation of BSL2+ containment. Biohazardous material must be kept locked up at all times when not in use and properly labelled.		
		29872-07/12/2007	Per e-mail from user: the samples contain less than 25 micrograms each of uranium.		

Analyze Hazards & Develop / Implement Controls

Experiment Hazard Classes are Used to Define Controls and Risk Level of Experiment and Define ESH Manual Requirements

- Beamline Operation
- Low Temperatures
- High Temperatures
- Lasers
- High Pressures
- Chemicals
- Biosafety
- Radioactivity
- Magnets
- Electromagnetic Waves
- Hydrogen
- Electronics
- Nanomaterials
- Other



Develop / Implement Controls

■ ESAF Requirements Tab

- Denotes APS Experiment Hazard Classes for this Experiment

General	Experimenters	Description	Materials	Equipment	Requirements	Comments Summary	Beamline Admin	APS Admin					
<p>The items listed in the boxes below are summaries of the necessary controls, procedures, etc. that are required to be in place before the experiment may begin. To see the full list of APS Experiment Hazard Classes and the detail of the individual classes, please click on one of the links in the header of the hazard class table below.</p>													
Status : Pending (Chrzas)			PEN : 22-BMD-IDD-2008-0610_0800				Role : APS ESRB						
Base	Cryo	High I	Laser	High P	Chem	BSL	Rad	Magnet	RF	EE	High V	Nano	Other
<input checked="" type="checkbox"/> HC 1.0	<input checked="" type="checkbox"/> HC 2.0	<input type="checkbox"/> HC 3.1 <input type="checkbox"/> HC 3.2 <input type="checkbox"/> HC 3.3	<input type="checkbox"/> HC 4.2 <input type="checkbox"/> HC 4.3a <input type="checkbox"/> HC 4.3b <input type="checkbox"/> HC 4.4	<input type="checkbox"/> HC 5.1 <input type="checkbox"/> HC 5.2 <input type="checkbox"/> HC 5.3 <input type="checkbox"/> HC 5.4	<input type="checkbox"/> HC 6.0 <input type="checkbox"/> HC 6.1 <input type="checkbox"/> HC 6.2 <input type="checkbox"/> HC 6.3 <input type="checkbox"/> HC 6.4 <input type="checkbox"/> HC 6.5 <input type="checkbox"/> HC 6.6 <input type="checkbox"/> HC 6.7	<input type="checkbox"/> HC 7.1 <input type="checkbox"/> HC 7.2 <input type="checkbox"/> HC 7.3 <input type="checkbox"/> HC 7.4 <input type="checkbox"/> HC 7.5	<input type="checkbox"/> HC 8.1 <input type="checkbox"/> HC 8.2 <input type="checkbox"/> HC 8.3	<input type="checkbox"/> HC 9.0	<input type="checkbox"/> HC 10.0	<input type="checkbox"/> HC 12.0	<input type="checkbox"/> HC 13.0	<input type="checkbox"/> HC 14.1 <input type="checkbox"/> HC 14.2 <input type="checkbox"/> HC 14.3	<input type="checkbox"/> HC 15.0

Develop / Implement Controls

■ ESAS Requirements Tab

- Short Summary of Requirements for Each Hazard Class

Hazard controls to be implemented before experiment may begin.

Experiment Safety Requirements Summary	
<p>Engineered Controls :</p> <p>(2.0) As determined by <u>Beamline</u> Design Review Process or other review. (1.0) As determined by <u>Beamline</u> Design Review Process.</p>	<p>Procedural Controls :</p> <p>(2.0) As determined by <u>Beamline</u> Design Review Process or other review. (1.0) As determined by <u>Beamline</u> Design Review Process.</p>
<p>Design Reviews and Equipment Inspections :</p> <p>(2.0) Cryogenic Equipment brought to the <u>APS</u> to be reviewed. Pressure safety must be reviewed. (1.0) <u>APS</u> reviews for standard <u>beamline</u> operation already exist.</p>	<p>PPE :</p> <p>(2.0) Proper <u>PPE</u> for handling cryogenic fluids if in use. (1.0) Safety glasses with side shields and appropriate gloves for incidental use of common solvents.</p>
<p>Signs and Labeling</p> <p>(2.0) Containers labeled with common name of liquid <u>cryogen</u>. (1.0) Proper labeling of chemical containers.</p>	<p>Dosimetry and Monitoring</p> <p>(2.0) None Required. (1.0) Only what is required for normal <u>beamline</u> operation.</p>
<p>Safety Training</p> <p>(2.0) ESH145 recommended for cryogenic liquids. (1.0) APS101, ESH100U, GERT, ESH223, ESH377, Sector Orientation</p>	

Perform Work Within Controls - Training

- Resident Users have JHQ
- Non-Resident Users have Mandatory Training to Work at APS
 - GERT
 - ESH100U (General User Facility Training for Users)
 - APS101 (APS Specific Training)
 - ESH223 (Cybersecurity)
 - ESH377 (Electrical Safety Awareness)
 - Sector-Specific Orientation
- ESAF can Autotrigger Additional Training
 - ESH120 (Lasers)
 - ESH700 (Radworker 1)
 - ESH590 (Nanomaterials)

Core APS Training (Due Date)					
GERT	APS 101	ESH100U	Sector	ESH223	ESH377
06/01/2008	03/29/2010	Completed	07/08/2009	02/01/2009	05/03/2009
07/15/2009	03/03/2013	Completed	07/08/2009	07/01/2008	08/15/2009
03/22/2009	03/21/2012	Completed		03/22/2008	03/22/2010
02/27/2010	03/01/2011	Completed	03/05/2008	01/01/2009	03/01/2009

Perform Work Within Controls

- ESAF Approved by Beamline and APS
- ESAF System Generates Two Documents:
 - Experiment Hazard Control Plan
 - *Posted at Beamline Station*
 - *Contains Summary of Experiment Hazards and Controls*
 - *Training Requirements*
 - *Reference to Attached Documents*

APS - Experiment Hazard Control Plan Report

1 of 8

Pen 16-IDD-2007-022

Experiment ID: 47271

Title Single Bunch X-ray Diffraction Measurements on Shock Compressed
Single Crystals

On-Site Spokesperson :

First Name	Last Name	Institution	Phone
------------	-----------	-------------	-------

Perform Work Within Controls

- Authorization to Perform Work
 - *Signed by Experiment OS, Beamline Staff and / or APS Safety*

APS ESAF - Experiment Authorization Form

PEN # : 16-IDD-2007-022

Experiment ID: 47271

Title :

ID Start Date : 08/08/2007

Single Bunch X-ray Diffraction Measurements on Shock Compressed

Single Crystals
On-Site Spokesperson :

The information on this hazard control plan is accurate and complete. All materials/samples to be used and hazards have been identified. All users are listed.

Perform Work Within Controls

- ESAF is Posted by Floor Coordinator
 - Oversight of ESAF
 - Shiftlog Entry
 - Work May Begin

- Users Perform Work
 - Follow Special Procedures Conditions
 - Safely Conduct Work Under Requirements of the EHCP
 - “Do As They Say”

- Beamline Staff, APS Staff
 - Responsible for Oversight of Work being Performed

- Anyone at ANL
 - Stop Work Authority, If Needed

Feedback and Improvement

■ During Review Process

- Feedback and Questions
 - *Content of Experiment*
 - *Hazards Identification*
 - *Control Implementation*

■ After Experiment User Completes End of Experiment Form

1. Was your visit to the APS a success ?

Highly successful (obtained all required data, will have big impact on my program)

Successful (obtained enough data to move program ahead)

Partially successful (obtained some data but not as much as expected)

Totally unsuccessful (no useful data, a waste of time)

Comments

APS-Specific Questions [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [Next](#)

Summary

- ESAF System Built with ISM as the Foundation
- Easy Part
 - Say What We Do
- Less Easy Part
 - Do What We Say

ESAF Upgrades During Last Shutdown

- Training E-mail
 - Sent to PI and Every OS Listed in ESAF

- Description Field can be Edited by User after ESAF Submitted

- New Linkage of Hazard Classes from Materials Table
 - Explosives
 - Engineered Nanomaterials
 - *Solid Substrate / Contained (Low)*
 - *Liquid Suspension (Medium)*
 - *Unbound (High)*
 - ESH590 Triggered Automatically

- Hazard Classes Reviewed and Requirements Table Updated