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## OPERATIONAL SAFETY PROCEDURE FORM

Person: Brown, Giles ( <a href="mailto:giles@jlab.org">giles@jlab.org</a> )		Status: APPR	
Org: PHALLD		Date: 4/2/2013 7:47:30 AM	
		<b>Operational Safety Procedure Review and Approval Form # 22021</b> <small>(See ES&amp;H Manual Chapter 3310 Appendix T1 Operational Safety Procedure (OSP) and Temporary OSP Procedure for Instructions)</small>	
Type:	OSP		
Serial Number:	FEL-13-22021-OSP		
Issue Date:	4/4/2013		
Expiration Date:	2/4/2016		
Title:	Hall D Solenoid Powered Operations OSP		
Location:	Hall D - 302	Location Detail:	Solenoid
Risk Classification:	Without mitigation measures (3 or 4):		3
	(See <a href="#">ES&amp;H Manual Chapter 3210 Appendix T3 Risk Code Assignment</a> ) With mitigation measures in place (N, 1, or 2):		1
Reason:	This document is written to mitigate hazard issues that are : <b>Determined to have an unmitigated Risk code of 3 or 4</b>		
Document Owner(s):	<b>Biallas, George</b> ( <a href="mailto:biallas@jlab.org">biallas@jlab.org</a> ) Primary <b>Whitlatch, Timothy</b> ( <a href="mailto:white@jlab.org">white@jlab.org</a> )		
Supplemental Technical Validations			
<b>Electricity</b> (Todd Kujawa) <b>Emergency Preparedness</b> (Tina Menefee) <b>Magnetic Fields</b> (Jennifer Williams)			
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Comments for reviewers/approvers:			
Attachments			
Procedure: <b>OSP - Hall D Solenoid Powered Operations.pdf</b> THA: <b>THA - Solenoid Powered Operations.pdf</b>  Additional Files: <b>D00000402-P002RevA- Solenoid Commissioning Plan (SIGNED).pdf</b> <b>D00000402-S015RevB Solenoid Operating Narrative(SIGNED).pdf</b> <b>D00000-09-01-0001 Solenoid Distribution Box P&amp;I (SIGNED).pdf</b> <b>D00000402-S014Rev- Solenoid Controls Strategy (SIGNED).pdf</b> <b>OSP - Hall D Solenoid Power Supply.pdf</b> <b>OSP - Cryogenic Operations (SIGNED).pdf</b> <b>OSP - Crane Operations.pdf</b> <b>D00000402-P007RevASolenoid Pre-Power Up Checklists (SIGNED).pdf</b>			
Review Signatures			
Person : Bailey, Mary Jo (mbailey)	Signed on 4/3/2013 8:28:57 AM by Mary Jo Bailey ( <a href="mailto:mbailey@jlab.org">mbailey@jlab.org</a> )		
Reasoning: Emergency			
Subject Matter Expert : Electricity	Signed on 4/2/2013 9:41:53 AM by Todd Kujawa ( <a href="mailto:kujawa@jlab.org">kujawa@jlab.org</a> )		
Subject Matter Expert : Magnetic Fields	Signed on 4/2/2013 10:51:04 AM by Jennifer Williams ( <a href="mailto:jennifer@jlab.org">jennifer@jlab.org</a> )		
Approval Signatures			
Division Safety Officer : PHALLD	Signed on 4/4/2013 1:26:32 PM by Patrizia Rossi ( <a href="mailto:rossi@jlab.org">rossi@jlab.org</a> )		
Org Manager : PHALLD	Signed on 4/3/2013 9:14:57 AM by Eugene Chudakov ( <a href="mailto:gen@jlab.org">gen@jlab.org</a> )		
Safety Warden : Hall D - 302	Signed on 4/3/2013 1:56:52 PM by Tom Carstens ( <a href="mailto:carstens@jlab.org">carstens@jlab.org</a> )		

12000 Jefferson Avenue, Newport News, VA 23606  
Phone: (757) 269-7100

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# Operational Safety Procedure Form

(See [ES&H Manual Chapter 3310 Appendix T1 Operational Safety Procedure \(OSP\) and Temporary OSP Procedure](#) for instructions.)

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## ANALYZE THE HAZARDS

### 1. Purpose of the Procedure

This document covers powered operation of the Hall D solenoid magnet. Four separate superconducting magnet coils will be connected in series and used during all powered operations. This document covers safety concerns related to power systems, superconducting magnet operations, control systems, and hazards associated with high magnetic fields.

### 2. Scope – include all operations, people, and/or areas that the procedure will affect.

This document covers powered operation of the magnet in Hall D. A separate OSP covers cryogenic operations, and another covers power supply operations. Installation is covered by JLab standard operating procedures. Operations include powering the magnet to 1500 A once suitable cryogenic conditions are established and the power supply tests are completed. All operations will be performed by JLab personnel. Note that all hazards associated with the powered operations are covered by the JLab EH&S manual, and that there are no unusual hazards that fall outside the scope of the manual.

### 3. Description of the Facility – include floor plans and layout of a typical experiment or operation.

The Hall D facility consists of a main area containing the magnet, associated magnet iron and support infrastructure, and a platform and stand supporting cryogenic vessels and supply lines. Adjacent areas contain control and monitoring computers, magnet power supply, controls racks, and a connection point to the cryogenic supply system. Cryogenics will be supplied by the JLab Cryo Group.

### 4. Authority and Responsibility:

#### 4.1 Who has authority to implement/terminate

George Biallas and Tim Whitlatch are the engineers in charge of operations. Any deviations from this OSP must be approved through them.

#### 4.2 Who is responsible for key tasks

The Cryogenics group is responsible for directing cryogenic operations; Power Supply operations will be managed by Hall D technical staff and Hall D users;

#### 4.3 Who analyzes the special or unusual hazards (See [ES&H Manual Chapter 3210 Appendix T1 Work Planning, Control, and Authorization Procedure](#))

Magnetic Field Hazard: Jennifer Williams

There are no special or unusual hazards associated with solenoid operations.

All hazards are covered by the EH&S manual

See attached Solenoid Powered Operations Task Hazard Analysis (document 1)

#### 4.4 What are the Training Requirements (See [http://www.jlab.org/div\\_dept/train/poc.pdf](http://www.jlab.org/div_dept/train/poc.pdf))

See the attached Hall D Crane Operations OSP (document 11) regarding training for all crane operators.

### 5. Personal and Environmental Hazard Controls Including:

## 5.1 Shielding

Powered operation of the magnet does not use or generate radiation. RadCon has implemented controls related to reuse of previously activated components.

Hand guards are installed around certain High Voltage components inside the power supply. These hand guards are clearly marked "High Voltage". There is also an electrical shielding enclosure around all of the power supply current cabling including lead junctions with the vapor cooled leads.

## 5.2 Interlocks

No Personnel Safety System interlocks are utilized during magnet systems operations.

See attached Hall D Solenoid Power Supply OSP (document 9) for power supply related interlocks

## 5.3 Monitoring systems

No PSS monitors are needed for the operation of the magnet system.

See attached Hall D Coil Test Solenoid Controls Strategy (document 6) for analysis of the role of the PLC concerning safety.

Hall D ODH monitors are operational.

## 5.4 Ventilation

See attached Cryogenic Operations OSP (document 10)

Other ventilation requirements are covered in EH&S PHY-10-043-OSP.

## 5.5 Other (Electrical, ODH, Trip, Ladder) (Attach related Temporary Work Permits or Safety Reviews as appropriate.)

Prior to powered operations all affected areas will be swept clean of loose magnetic materials as per EH&S manual guidelines.

The solenoid can generate magnetic fields of up to 600G in the zones that extend somewhat beyond the magnet bore. This zone is accessible from the upstream work platform. With the magnet turned on EH&S personnel will evaluate field strengths and set up appropriate boundaries, for the 5G boundary restricting general access, the 200G crane boundary, and the 600G whole body boundary. All powered operations, especially those with 5G contours outside of our area, will be restricted as agreed upon with building safety warden Tom Carstens and all affected groups.

The power supply is interlocked to limit current to 1500 A.

Crane operations will be prohibited inside the 200 Gauss field boundary. See the attached Hall D Crane Operations OSP (document 11)

See the attached Cryogenic Operations OSP (document 10)

See the attached Hall D Solenoid Power Supply OSP (document 9)

## 6 List Of Safety Equipment

### Personal Protective Equipment

No PPE is needed during powered solenoid operations.

### Special Tools

No special tools are needed during powered solenoid operations.

## DEVELOP THE PROCEDURE

### 1. Associated Administrative Controls

EH&S personnel will determine 5G and other magnetic field boundaries. RadCon has determined boundaries around previously activated components. The magnet bore and the area beneath the magnet will be roped off when LHe is present in the cryostat and posted as ODH1 due to presence of He relief valves.

Flashing red beacons mounted at the Hall entrance, indicating the presence of a 5 Gauss magnetic field, will be posted at the 5G boundary.

Powered operation will be coordinated with other affected groups in the Hall.

Crane operations will be restricted to be outside the 200G area when the magnet is energized. See the attached Hall D Crane Operations OSP (document 11)

Magnet power supply doors will be locked while the magnet coil is energized. A LED sign, activated by 2 amps or more, above the power supply reads: "Current In Magnet – Do Not Open Power Supply". This sign is on UPS power because the hazard can exist even when all power to the Hall has failed.

The power supply and associated magnet shall be operated in a safe manner, within the operational limits of the magnet system as detailed in the attached documents.

See attached Solenoid Operating Narrative (document 2), Solenoid Controls Strategy (document 6), Hall D Solenoid Power Supply OSP (document 9), Cryogenics OSP (document 10), and Solenoid Commissioning Plan (document 3)

### 2. Operating Guidelines

See attached Solenoid Commissioning Plan (document 3), Solenoid Operating Narrative (document 2), Solenoid Controls Strategy (document 6), and Solenoid Distribution Box P&I (document 5)

### 3. Notification of Affected Personnel (who, how, and when)

All groups potentially affected by magnet fields generated by the magnet will be notified prior to powered operation, and all powered operations will be coordinated with the Hall D work coordinator. Crane operations will be restricted during powered operation See the attached Hall D Crane Operations OSP (document 11). Some public walkways will be roped off due to the presence of magnetic fields. The power supply will display "Current In Magnet – Do Not Open Power Supply". The Engineer in Charge is responsible for ensuring appropriate notifications are performed.

**4. List the Steps Required to Execute the Procedure:** from start to finish.

See attached Hall D Solenoid Power Supply OSP (document 9), Solenoid Pre-Power Checklists (document 4), and Solenoid Commissioning Plan (document 3).

**5. Back Out Procedure(s)** i.e. steps necessary to restore the equipment/area to a safe level.

See Solenoid Commissioning Plan (document 3).

**6. Special environmental control requirements:**

When operated at full current, 1500 A, the moderate magnetic field bulging from the ends of the magnet bore is estimated to decrease to 600G at about 2 ft. out. Fields of low hundreds of Gauss are at the yoke surface, tapering to a 5G field near public walkways and other areas. The boundary will be roped off and marked according to JLab EH&S requirements. EH&S personnel will carefully map the field when a coil is powered for the first time to identify areas that need to be marked and verify calculations. The current will be ramped in steps so that these areas can be identified for a variety of operating currents. Access to the magnet bore will be restricted when LHe is present in the cryostat.

**6.1 Environmental impacts** (See [EMP-04 Project/Activity/Experiment Environmental Review](#))

There are no known environmental impacts related to powered magnet operations. All blow-off gases are environmentally safe.

**6.2 Abatement steps** (secondary containment or special packaging requirements)

No special abatement steps are required for powered magnet operation. Adjacent areas will be swept clean of magnetic materials according to EH&S requirements.

**7. Unusual/Emergency Procedures** (e.g., loss of power, spills, fire, etc.)

An on-call pager number will be registered with the Guard Shack. Authorized Hall D personnel will be available 24 x 7 to respond to emergencies via the pager number registered with the Guard Shack. Emergency responders must be aware that magnetic fields and electrical energy can still remain in the system for possibly an hour or more, even after emergency shutdown. Security guards and accelerator crew chiefs have been informed of all the hazards.

**8. Instrument Calibration Requirements** (e.g., safety system/device recertification, RF probe calibration)

No special calibrations are required to ensure personnel safety. All devices in safety systems are calibrated according to EH&S requirements.

**9. Inspection Schedules**

No special inspection schedules are required.

**10. References/Associated Documentation**

The following documents are attached to or referenced by this OSP:

- 1) Solenoid Powered Operations, Task Hazard Analysis
- 2) Solenoid Operating Narrative (D00000-04-02-S015)
- 3) Solenoid Commissioning Plan (D00000-04-02-P002)

- 4) Pre-Power Checklist (D00000-04-02-P007)
- 5) Solenoid Distribution Box P&I (D00000-09-01-0001)
- 6) Solenoid Controls Strategy (D00000-04-02-S014)
- 9) Hall D Solenoid Power Supply OSP
- 10) Cryogenic Operations OSP
- 11) Hall D Crane Operations OSP

**11. List of Records Generated (Include Location / Review and Approved procedure)**

HDLList has been used during installation. An electronic operator log will be used during magnet testing. Extensive archive data will be recorded by the HMI software on a Windows PC. All PLC channels will be archived at appropriate rates.  
 Signed check lists will be scanned into HDList.

**Click**  
 To Submit OSP  
 for Electronic Review

**Distribution:** Copies to: affected area, authors, Division Safety Officer

**Expiration:** Forward to ESH&Q Document Control

**Form Revision Summary**

- Revision 1.2 – 09/15/12** – Update form to conform to electronic review.
- Revision 1.1 – 04/03/12** – Risk Code 0 switched to N to be consistent with [3210 T3 Risk Code Assignment](#).
- Revision 1 – 12/01/11** - Added reasoning for OSP to aid in appropriate review determination.
- Revision 0 - 10/05/09** – Updated to reflect current laboratory operations

ISSUING AUTHORITY	FORM TECHNICAL POINT-OF-CONTACT	APPROVAL DATE	EXPIRATION DATE	REV.
ESH&Q Division	<a href="#">Harry Fanning</a>	12/01/11	12/01/14	1.2

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