Person: Butler, Jessie (jbutler@jlab.org)
Org: PHALLA

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Jefferson Lab
Thomas Jefferson National Accelerator Facility

Operational Safety Procedure Review and Approval Form # 123466
(See ES&H Manual Chapter 3310 Appendix T1 Operational Safety Procedure (OSP) and Temporary OSP Procedure for Instructions)

Type:	***OSP*** Click for OSP/TOSP Procedure Form Click for LOSP Procedure Form Click for LOTO-COMPLEX Information Click for LOTO-GROUP Information		
Serial Number:	***ENP-21-123466-OSP***		
Issue Date:	***11/9/2021***		
Expiration Date:	***11/9/2024***		
Title:	***SBS Motioning/Positioning System***		
Location: (where work is being performed) Building Floor Plans	***101 - Experimental Hall A***	Location Detail: (specifics about where in the selected location(s) the work is being performed)	***Main floor of the Hall, downstream of the pivot.***
Risk Classification: (See ES&H Manual Chapter 3210 Appendix T3 Risk Code Assignment)	Without mitigation measures (3 or 4): With mitigation measures in place (N, 1, or 2):		***2*** ***1***
Reason:	This document is written to mitigate hazard issues that are : ***Not Applicable***		
Owning Organization:	***PHALLA***		
Document Owner(s):	***Butler, Jessie (jbutler@jlab.org)*** Primary		

Supplemental Technical Validations

Solvents (> 1 Gallon, Non-Flammable) (Imani Burton, Jennifer Williams)
50V or Greater: De-energized Work (Phillip Stanley, Tim Fitzgerald)
ODH 0 and 1 (Imani Burton, Jennifer Williams)
Pinch Points (Bert Manzlak, Paul Collins)
Pressurized Vacuum Lines and Piping Systems (Dave Meekins, Kelly Dixon, Timothy Whitlatch, Will Oren)
Controlled Area (Adam Hartberger, David Hamlette, Keith Welch)
Stored Energy: Mechanical, Hydraulic, Pneumatic (Bert Manzlak, Paul Collins)
ESH&Q Liasion (Bert Manzlak)

Document History

Revision	Reason for revision or update	Serial number of superseded document

1	***Update to the procedure.***	

Lessons Learned	Lessons Learned relating to the hazard issues noted above have been reviewed.
Comments for reviewers/approvers:	***This OSP is a revision to OSP# ENP-21-119594-OSP.***

Attachments

Procedure: ***OSP_SBS_MotioningSystem.pdf***
THA: ***THA_ SBS_MotioningSystem.pdf***
Additional Files: ***Procedure_SBS_MotioningSystem.pdf***

Review Signatures

Subject Matter Expert : Chemicals->Solvents (> 1 Gallon-> Non-Flammable)	**Signed** on 11/8/2021 8:26:35 AM by Jennifer Williams (jennifer@jlab.org)
Subject Matter Expert : Electricity->50V or Greater: De-energized Work	**Signed** on 11/8/2021 9:34:40 AM by Tim Fitzgerald (tfitzger@jlab.org)
Subject Matter Expert : Oxygen Deficiency Hazards (ODH)->ODH 0 and 1	**Signed** on 11/8/2021 8:26:35 AM by Jennifer Williams (jennifer@jlab.org)
Subject Matter Expert : Pinch Points	**Signed** on 11/8/2021 7:56:27 AM by Bert Manzlak (manzlak@jlab.org)
Subject Matter Expert : Pressure Systems->Pressurized Vacuum Lines and Piping Systems	**Signed** on 11/8/2021 11:36:32 AM by Will Oren (oren@jlab.org)
Subject Matter Expert : Radiation - Ionizing->Controlled Area	**Signed** on 11/8/2021 12:59:23 PM by Keith Welch (welch@jlab.org)
Subject Matter Expert : Stored Energy: Mechanical-> Hydraulic-> Pneumatic	**Signed** on 11/8/2021 8:23:59 AM by Bert Manzlak (manzlak@jlab.org)

Approval Signatures

Division Safety Officer : PHALLA	**Signed** on 11/8/2021 12:59:52 PM by Ed Folts (folts@jlab.org)
ESH&Q Division Liasion : PHALLA	**Signed** on 11/8/2021 4:03:29 PM by Bert Manzlak (manzlak@jlab.org)
Org Manager : PHALLA	**Signed** on 11/9/2021 12:05:02 AM by Cynthia (Thia) Keppel (keppel@jlab.org)
Safety Warden : Experimental Hall A	**Signed** on 11/8/2021 1:02:39 PM by Jessie Butler (jbutler@jlab.org)

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Thomas Jefferson National Accelerator Facility

Operational Safety Procedure Form

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

Click For Word Doc

Title:	SBS Motioning/Positioning System		
Location:	Experimental Hall A – Downstream of Pivot	**Type:**	☒ OSP ☐ TOSP
Risk Classification (per Task Hazard Analysis attached) (See *ES&H Manual Chapter 3210 Appendix T3 Risk Code Assignment*.)		**Highest Risk Code Before Mitigation**	2
		Highest Risk Code after Mitigation (N, 1, or 2):	1
Owning Organization:	Physics / Hall A	**Date:**	5 November 2021
Document Owner(s):	Jessie Butler		

DEFINE THE SCOPE OF WORK

1. Purpose of the Procedure – Describe in detail the reason for the procedure (what is being done and why).

Moving Super BigBite Spectrometer (SBS) magnet and counterweight assembly.

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

Moving SBS magnet and counterweight assembly will affect exit beamline vacuum, anyone working in the vicinity of SBS magnet and the operations of the BigBite magnet, Upstream and downstream corrector magnets.

3. Description of the Facility – include building, floor plans and layout of the experiment or operation.

Experimental Hall A – Downstream of the pivot area.

ANALYZE THE HAZARDS and IMPLEMENT CONTROLS

4. Hazards identified on written Task Hazard Analysis

Please see associated THA, but main risks are:

- Pinch point
- Stored Energy
- Radiation Hazard
- ODH
- Electrical Hazard
- Pressure System
- Magnetic Field

5. Authority and Responsibility:

5.1 Who has authority to implement/terminate

Hall A Work Coordinator

5.2 Who is responsible for key tasks

Members of the Hall A Tech Staff

5.3 Who analyzes the special or unusual hazards including elevated work, chemicals, gases, fire or sparks (See ES&H Manual Chapter 3210 Appendix T1 Work Planning, Control, and Authorization Procedure)

Hall A Work Coordinator or designee

6. Personal and Environmental Hazard Controls Including:

6.1 Shielding

N/A

6.2 Barriers (magnetic, hearing, elevated or crane work, etc.)

Keep out zones will be identified using cones and flashing lights

6.3 Interlocks

N/A

6.4 Monitoring systems

N/A

6.5 Ventilation

N/A

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

Electrical – Control boxes will be plugged into a bertha
Trip – Multiple hoses and cords will be used and strung along the floor during procedure
Chemicals – Hydraulic oil is used in the pumps and reservoirs.

7. List of Safety Equipment:

7.1 List of Safety Equipment:

Safety Shoes – Required
Gloves - Required
Safety Glasses – Required when bleeding up vacuum. Recommended any other time.
Hearing Protection – Required when bleeding up vacuum. Recommended any other time.

7.2 Special Tools:

N/A

8. Associated Administrative Controls

This OSP, associated THA, Hall A Conduct of Operation (COO), and configuration control for access the Hall in MCC.

9. Training

9.1 What are the Training Requirements (See List of Training Skills)

Hall A Awareness Training (SAF110)
Radiation Worker 1 Training (SAF801C, SAF801T, & SAF801P)
ODH Training (SAF103)
Read and sign Hall A's Conduct of Operations (COO)
Read and sign this OSP
JLAB (QEW) Qualified Electrical Worker Training

Operational Safety Procedure Form

DEVELOP THE PROCEDURE

10. Operating Guidelines

Conduct a pre-job walk-down to identify potential areas of interferences.
A minimum of three people are required to perform this procedure.
Ensure that all the steps listed under line item 12 of this form are performed.

11. Notification of Affected Personnel (who, how, and when include building manager, safety warden, and area coordinator)

Contact Hall A Work Coordinator prior to starting work

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

Please see attachment - Steps for Moving/Positioning SBS Magnet

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

1. Lock jacks in current position
2. Remove power from actuators
3. Clear and block off the area surrounding the magnet
4. Contact Hall A Work Coordinator
5. Re-assess the job and hazards

14. Special environmental control requirements:

14.1 List materials, chemicals, gasses that could impact the environment (ensure these are considered when choosing Subject Mater Experts) and explore EMP-04 Project/Activity/Experiment Environmental Review below

Hydraulic oil

14.2 Environmental impacts (See EMP-04 Project/Activity/Experiment Environmental Review)

If a large amount of Hydraulic oil is spill, it could adversely affect the environment.

14.3 Abatement steps (secondary containment or special packaging requirements)

N/A

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

In the event of injury, or an immediate emergency exists, call **911** and also notify:

- Guards (**x5822**)
- Occupational Medicine (**x7539**)
- Crew Chief (**x7045**) (if inside the fence)

In case of an injury follow standard JLAB procedures. Initial response cards are located with each phone for appropriate emergency phone numbers. Additional information can be found at https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-24400/*.pdf.

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

N/A

17. Inspection Schedules

All Hydraulic hoses must be inspected before use

18. References/Associated/Relevant Documentation
This OSP and associated THA
19. List of Records Generated (Include Location / Review and Approved procedure)
N/A

Submit Procedure for Review and Approval (See ES&H Manual Chapter 3310 Appendix T1 OSP & TOSP Instructions – Section 4.2 Submit Draft Procedure for Initial Review):

- Convert this document to .pdf
- Open electronic cover sheet: https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-24048/3310T1Form.doc
- Complete the form
- Upload the pdf document and associated Task Hazard Analysis (also in .pdf format)

Distribution: Copies to Affected Area, Authors, Division Safety Officer
Expiration: Forward to ES&H Document Control

Form Revision Summary

Revision 1.7 – 02/25/2021 – Corrected link to Word doc; updated 'ESH&Q' to "ES&H'; other minor edits. No approval required.
Revision 1.6 – 06/23/2020 – Update section 15 to reflect guard number, what to do in an emergency, crew chief numbers, etc. approved by H. Fanning
Revision 1.5 – 04/11/18 – Training section moved from section 5 Authority and Responsibility to section 9 Training
Revision 1.4 – 06/20/16 – Repositioned "Scope of Work" to clarify processes
Qualifying Periodic Review – 02/19/14 – No substantive changes required
Revision 1.3 – 11/27/13 – Added "Owning Organization" to more accurately reflect laboratory operations.
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 1.0 – 12/01/11 – Added reasoning for OSP to aid in appropriate review determination.
Revision 0.0 – 10/05/09 – Updated to reflect current laboratory operations

ISSUING AUTHORITY	FORM TECHNICAL POINT-OF-CONTACT	APPROVAL DATE	REVIEW DATE	REV.
ES&H Division	Harry Fanning	04/11/18	02/25/24	1.6

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Thomas Jefferson National Accelerator Facility

Task Hazard Analysis (THA) Worksheet

(See ES&H Manual Chapter 3210 Appendix T1
Work Planning, Control, and Authorization Procedure)

Click For Word

Author:	Jessie Butler	**Date:**	05 November 2021	**Task #:** If applicable	N/A

Complete all information. Use as many sheets as necessary

Task Title:	SBS Motioning/Positioning System			**Task Location:**	Experimental Hall A
Division:	Physics	**Department:**	Hall A	**Frequency of use:**	As Needed
Lead Worker:	Jessie Butler or Designee				
Mitigation already in place: Standard Protecting Measures Work Control Documents	Associated OSP and Hall A's Conduct of Operations (COO)				

Sequence of Task Steps	Task Steps/Potential Hazards	Consequence Level	Probability Level	Risk Code (before mitigation)	Proposed Mitigation (Required for Risk Code >2)	Safety Procedures/ Practices/Controls/Training	Risk Code (after mitigation
1	Pinch Point	M	L	2	Pre-job walk-down to identify potential pinch points.	Associated OSP	1
2	Stored Energy	M	L	2	Ensure pressure is released on hydraulic system before disconnecting hoses	Pressure systems training	1
3	Class 2 Electrical Hazard	M	L	2	Ensure power is OFF to the actuator control box before unplugging. Use applicable Bertha OSP	JLAB Qualified Electrical Work (QEW) training Bertha OSP	1
4	Radiation Hazard	L	L	1	Ensure radiation level are understood before entering the area	Radiation 1 worker training	EL
5	Pressure System	L	L	1	Hear protection and glasses when bleeding up system	Pressure systems training	EL

Task Hazard Analysis (THA) Worksheet

(See ES&H Manual Chapter 3210 Appendix T1 Work Planning, Control, and Authorization Procedure)

Sequence of Task Steps	Task Steps/Potential Hazards	Consequence Level	Probability Level	Risk Code (before mitigation)	Proposed Mitigation (Required for Risk Code >2)	Safety Procedures/ Practices/Controls/Training	Risk Code (after mitigation
6	ODH	L	L	1	Be mindful of ODH levels before entering the Hall	ODH training	EL
7	Magnetic Field	L	L	1	Verify magnet power supply is off	Equipment Specific Training and Hall Awareness Training	EL

Highest Risk Code before Mitigation:	2	**Highest Risk Code after Mitigation:**	1

When completed, if the analysis indicates that the Risk Code before mitigation for any steps is "medium" or higher (RC≥3), then a formal Work Control Document (WCD) is developed for the task. Attach this completed Task Hazard Analysis Worksheet. Have the package reviewed and approved prior to beginning work. (See ES&H Manual Chapter 3310 Operational Safety Procedure Program.)

Task Hazard Analysis (THA) Worksheet

(See ES&H Manual Chapter 3210 Appendix T1
Work Planning, Control, and Authorization Procedure)

Form Revision Summary

Revision 0.2 – 07/26/21 – Periodic Review; updated header and footer
Periodic Review – 08/29/18 – No changes per TPOC
Periodic Review – 08/13/15 – No changes per TPOC
Revision 0.1 – 06/19/12 - Triennial Review. Update to format.
Revision 0.0 – 10/05/09 – Written to document current laboratory operational procedure.

ISSUING AUTHORITY	TECHNICAL POINT-OF-CONTACT	APPROVAL DATE	REVIEW DATE	REV.
ES&H Division	Harry Fanning	08/29/18	07/26/24	0.2

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Steps for Moving/Positioning SBS Magnet:

Bleed up Exit Beamline Vacuum:

***** WARNING: PLEASE CONTACT RADCON FOR AUTHORIZATION TO WORK IN THE AREA BEFORE PROCEEDING*****

1. Turn off and lock out power to SBS, BB, and both exit beamline correctors (to be done by a QEW).
2. Conduct a walk-around of the SBS magnet and counterweight to ensure there will not be any interference from cables and equipment when moving the equipment.
3. Determine current and final angles of SBS magnet. If the magnet starts or finishes on or below 20 degrees, continue to *Step 4*. If starting or finishing angle is greater than 20 degrees, please proceed to *Step 10*.

******PLEASE NOTE: CONSTANT MONITORING OF TARGET CHAMBER VACUUM IS REQUIRED FOR STEPS 4 – 9. IF AT ANY POINT THE VACUUM RISE MORE THAN A DECADE (i.e., 6 range to 5 range); PLEASE STOP, CONTACT THE WORK COORDINATOR, and REASSESS******

4. Check and record vacuum levels in target chamber and exit beamline. Target chamber vacuum can be read on the Cold Cathode display in rack 1H75B08 & Exit Beamline vacuum can be read on Convectron display in rack 1H75B09.
5. Call MCC (x7050) and ask the SSO to close the upstream and downstream target chamber isolation valves; VBV1H04B and VBV1H04X, respectively.
6. Once valves are closed, monitor chamber vacuum for at least five minutes looking for a rise in vacuum pressure.
   a. If chamber experiences more than a decade rise, have MCC reopen valves and contact Work Coordinator and notify Target Group.
   b. If vacuum holds with less than a decade rise, proceed to Step 4.
7. Turn off exit beamline turbo.
8. Wait for turbo to spin down and then turn off backing pump. Please note: Turbo spin down could take up to an hour.
9. Disconnect control cable from VBV1H04X and lock out. Bleed up exit beamline to atmosphere – DO NOT disconnect any exit beamline components during this procedure. To disconnect beamline, please refer to the *"Exit Beamline Change Out"* OSP.

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10. Remove stabilizing braces that connect upstream and downstream corrector magnets to SBS magnet steel.

Moving/Positioning the Magnet:

******PLEASE NOTE: FOR STEPS 11 – 25, USE TWO (front/back & side/side) 4' BUBBLE LEVELS TO MONITOR LEVELNESS OF THE SBS MAGNET DURING THE MOVE. PLEASE ENSURE THAT A PORTION OF THE BUBBLE ALWAYS REMAINS INSIDE THE LINE AT ALL TIMES******

11. Connect hydraulic pumps and hoses to the four hydraulic cylinders. Warning possible stored energy
12. While monitoring clearance around exit beamline, slightly raise magnet until there is a 1/8" to 1/4" gap at the center rotating point on the Hillman Rollers shaft.
13. Rotate Hillman Rollers so that they all point in new position direction.
14. While monitoring clearance around beamline, lower SBS magnet down until roughly a 1/16" gap is at the rotating point of the Hillman Rollers.

*****WARNING: THERE SHOULD BE NO MORE THAN TWO ACUATORS CONNECTED TO THE MAGNET AT ANY GIVEN TIME*****

15. Mount actuator bases in new position location on floor plates.
16. Connect actuators to base using appropriate pins.
17. Connect actuator to power source [plug-in] and check extending/retracting motions.
18. Adjust and set proper length of actuators before connecting to counterweight steel.
19. Connect actuators to counterweight using appropriate pins.
20. Lower SBS all the way down on Hillman Rollers and ensure that the actuators will be pushing in a straight and level manner that will keep them from twisting/binding.
21. Move SBS to new location using actuators – Please note: You may need to reposition the actuators and repeat steps 11 – 20 to reach desired location. Warning possible stored energy
22. Once SBS is in desired location, raise magnet to show a 1/16" gap at rotating point of Hillman Rollers.
23. Disconnect actuators. This may require moving the actuator in/out to release the mounting pin. Warning possible stored energy
24. Once actuators are disconnected, set SBS magnet to proper height for run (Survey & Alignment maybe needed for this step).
25. Lock hydraulic jacks at final position.

******PLEASE NOTE: ONCE THIS STEP HAS BEEN COMPLETED, YOU CAN START ROUGHING DOWN THE EXIT BEAMLINE VACUUM******

26. Disconnect hydraulic pumps and hose. Warning possible stored energy
27. Disconnect and store actuator control boxes and store on moving cart.
28. Tuck short actuators cables underneath actuator and base.
29. Reinstall braces on upstream and downstream corrector magnets. Ensure proper braces are installed according to the SBS specific setup. If unsure about the current SBS setup, please stop and contact the Hall A Work Coordinator or Hall A Lead Engineer.
30. Ensure bump stops are installed between SBS and BigBite magnets that are design to prevent them from coming together.

******PLEASE NOTE: Steps 31 – 35 is only required if the exit beam line was bled up while performing this procedure. If exit beamline was not bled up, please proceed to Step 36***

31. Rough down the exit beamline vacuum until below 100 mTorr. This could take a few hours.
32. Once vacuum is below 100 mTorr, startup exit beamline turbo and backing pump, reconnect control cable to VBV1H04X
33. Once vacuum has reached 0 mTorr of the exit beamline Convectron gage [rack 1H75B09], monitor the chamber vacuum gage and open the downstream valve VBV1H04X by calling MCC
    a. If vacuum maintains continue to Step 34
    b. If vacuum goes bad, close valve VBV1H04X, contact the Work Coordinator and notify Target Group
34. While monitoring chamber vacuum, open the target chamber upstream valve [VBV1H04B].
    a. If vacuum maintains continue to Step 35.
    b. If vacuum goes bad, close valve VBV1H04B, call the Work Coordinator and notify Target Group.
35. Monitor the vacuum for at least five minutes to ensure all vacuums remain stable.

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36. Make sure SBS magnet and counterweight steel is clear of all loose material, tools, and debris.
37. Make sure all ferrous metals (e.g., carbon steel, cast iron, titanium, etc.) that are not securely mounted are moved >50 feet away from the magnet.
38. Conduct a final review of the job and make sure all tools and equipment are properly stored.
39. Make a log entry in the HALOG book describing the work performed.

By signing this page, you testify that you have read, understand, and agree to abide by the procedure specified in the above referenced work control document:

Serial Number: ENP-21-123466-OSP

Title: SBS Motioning/Positioning System

Name	Signature	Date