NSLS II 6-BM BMM Beam Line Personal Protection System Certification Validation Check List
G. Ganetis 7/11/2017

Beam Line __6-BM_BMM_____

The following check list represents the documents and tasks that summarize the review the evaluator has done for a NSLS II Beam Line Personal Protection System:

Document or Task	**Documents Reviewed**	**Checked**	**Comments**
Beam Line Logic Diagram	LT-EL-BL-EI-PPS-2060-96_REV-A.pdf		
Front End Logic Diagram	LT-EL-BL-EI-PPS-0101-92_REV-F.pdf		
Beam Line Logic Diagram reviewed by PS Radiation Safety Committee (Sub Committee)	logic_2id_6bm_2016_final.pdf		
Electrical Schematics First Optical Enclosure Hutch Water Flow Trip Amplifiers Front End –Network/ System Front End-SR 6 I/O Box	 LT-EL-BL-EI-PPS-2060-91_REV-A.pdf LT-EL-BL-EI-PPS-2060-93_REV-A.pdf LT-EL-BL-EI-PPS-2060-92_REV-A.pdf LT-EL-BL-EI-PPS-0101-90 _REV-B.pdf LT-EL-BL-EI-PPS-0101-91_REV-B.pdf LT-EL-SR-EI-PPS-0206-90 _REV-C.pdf		 (A Chain) (B Chain)
Certification Test Procedure with executed check lists. Water Interlock Addendum	NSLS-II Beamline 6-BM Radiological Interlock Test 3.08.2017.pdf Addendum to 6-BM Radiological Interlock Test 7.5.2017.pdf		
Beam Line Tour & Secure Demonstration			If Requested
Mechanical Inspection reports for Beam line Hutch Doors	Door Inspection Report for 6-BM 3_21_17.pdf		
Design Description for Beam Lines and Front End PPS	PS-C-XFD-SPC-PPS-001		(Copies available upon request)
Maintenance Procedures	PS-C-XFD-PRC-023		(Copies available upon request)
Network Isolation Test Procedure	PS-C-XFD-PRC-022		(Copies available upon request)

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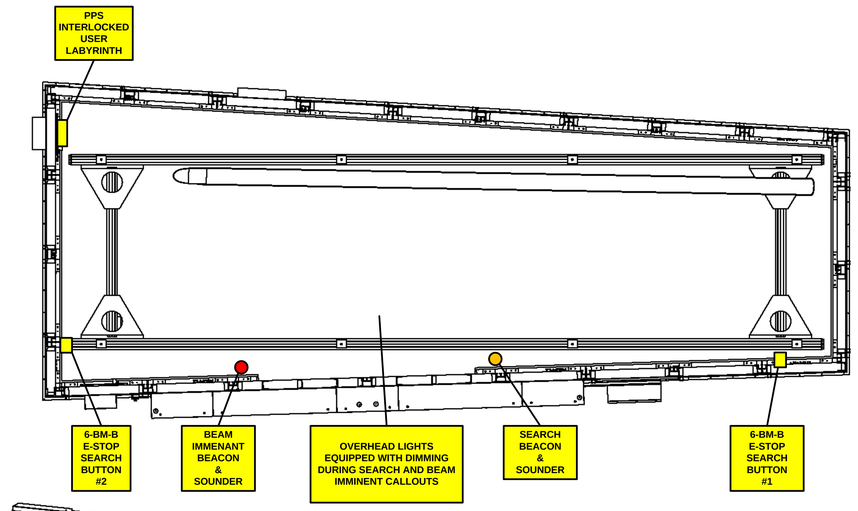
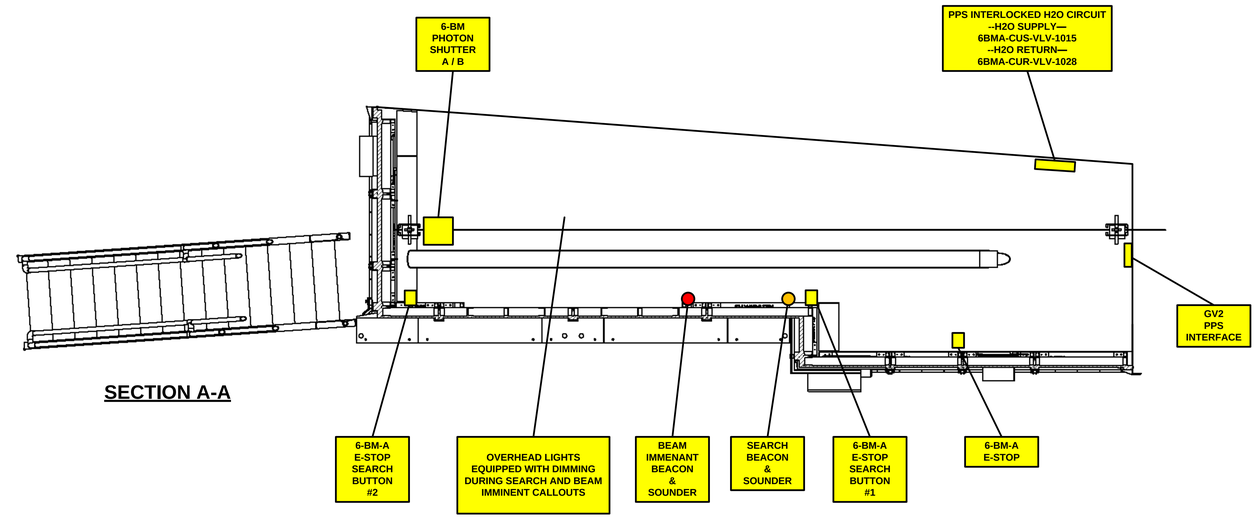
PPS Equipment Layout Drawing	LT-EL-BL-EI-HCH-2060_REV-A.pdf		
ECNs required during Certification using Small Change Procedure	None		
Deviation Reports on Installed system	None		
PPS PLC Software under Configuration Control 6-BM Chain A PPS Front End P3 Program Stored 6-BM Chain B PPS Front End P3 Program Stored 6-BM Chain A PPS Beamline Program Stored 6-BM Chain B PPS Beamline Program Stored	 LT-EL-BL-EI-PPS-0101-72_REV-F.pdf LT-EL-BL-EI-PPS-0101-82_REV-G.pdf LT-EL-BL-EI-PPS-2060-70_REV-A.pdf LT-EL-BL-EI-PPS-2060-71_REV-A.pdf		This section contains the new system storing the PLC program in the Electrical Design room.

Evaluator _____ _____ Date _____
Print Name Signature

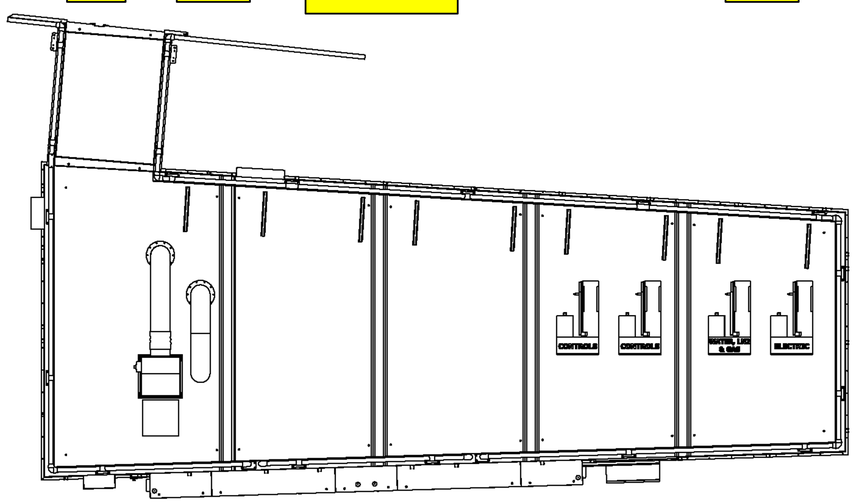
REV	DESCRIPTION	BY	DATE	CHK	APP
A	INITIAL RELEASE	JARZABKOWSKI	4/06/2017	JM	AS

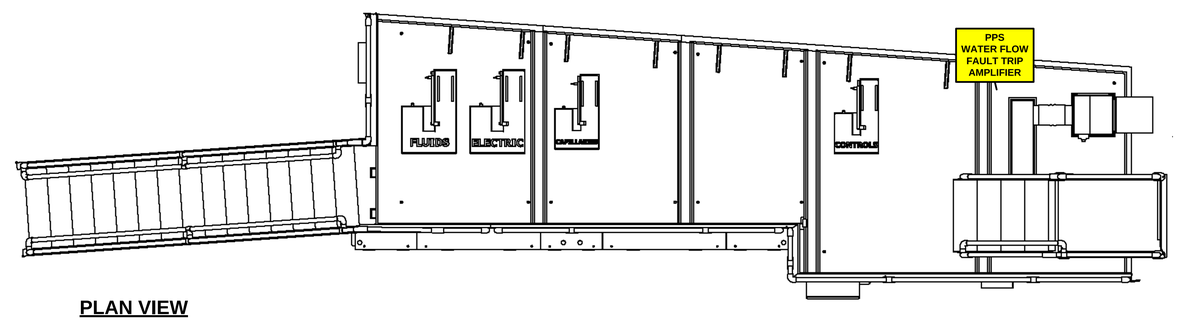




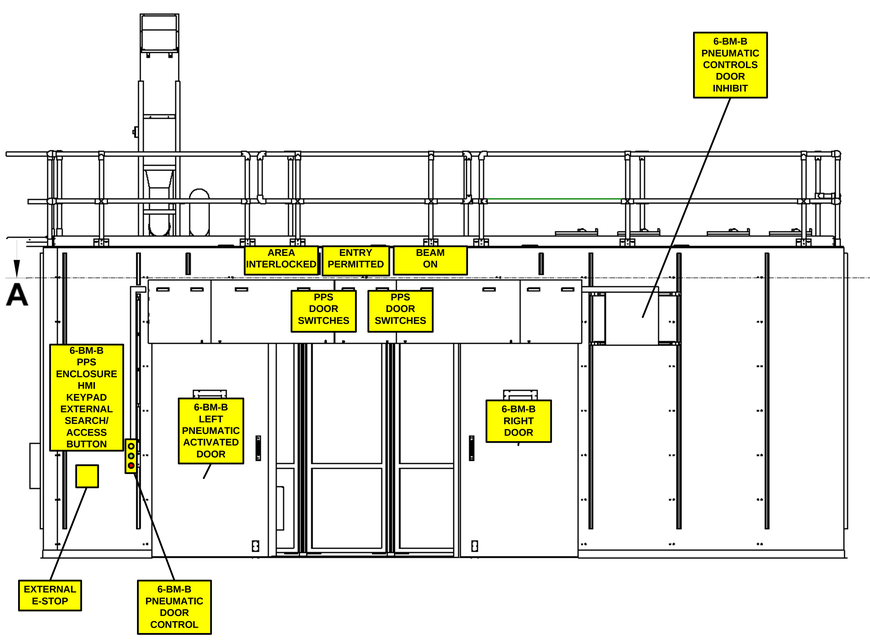
SECTION A-A

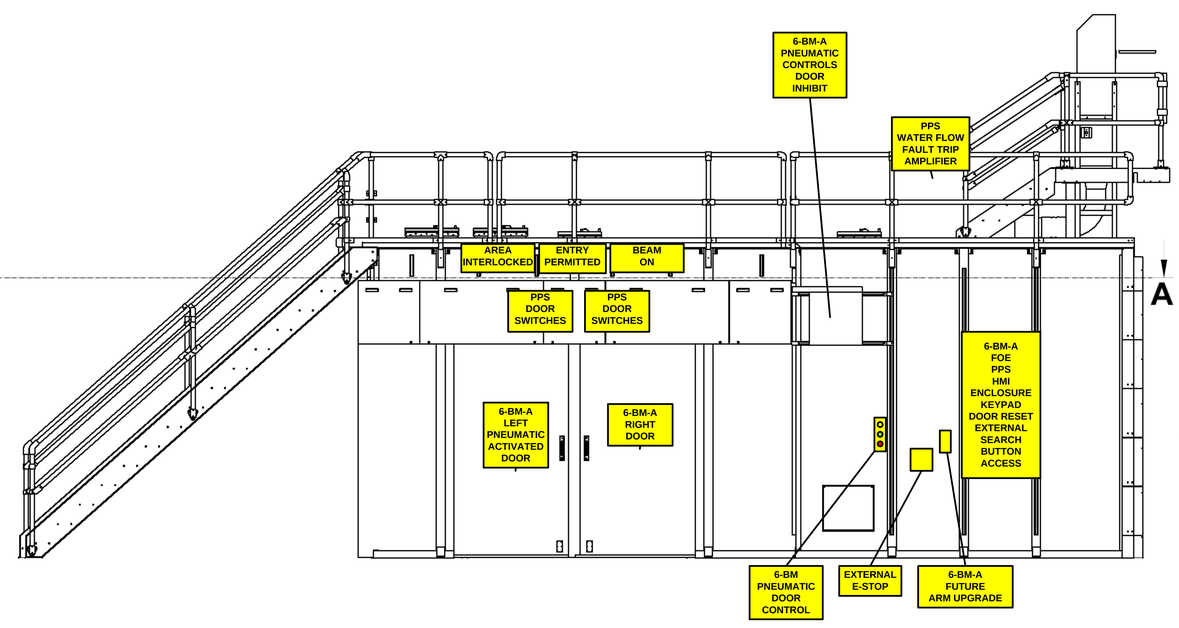
BEAM DIRECTION





PLAN VIEW





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UPTON, NEW YORK 11973
Exploring Life's Mysteries, Protecting its Future

NSLSII NATIONAL SYNCHROTRON LIGHT SOURCE II

UNLESS OTHERWISE SPECIFIED
INTEGER TOLERANCES ± .06
DECIMAL TOLERANCES
X ± .030
.XX ± .015
.XXX ± .010
ANGULAR TOLERANCE ± 0.5°
UNSPECIFIED RADII .02 MAX
125 BREAK SHARP CORNERS AND EDGES
FINISH MAX .03 MIN .005

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES MILLIMETERS EQUIV. FOR REF. ONLY
INTERPRET DRAWING AS PER ANSI Y14.5 OR Y32.2

ESH&Q RISK LEVEL A-2

		DATE	OUTSTANDING ECN'S
DRWN BY	S. JARZABKOWSKI	4/06/2017	
CHK BY	J. MALLEY	4/06/2017	
ENG APP	S. BUDA	4/06/2017	
SUPV APP	G. GANETIS	4/28/2017	
QA APP	E. CHESWICK	4/07/2017	
ESH APP	R. LEE	4/10/2017	

PPS EQUIPMENT LAYOUT DRAWING, FOR 6-BM HUTCH (BMM)

LT-EL-BL-EI (DRAWING DIRECTORY) | LT-EL-BL-EI-HCH-2060 (DRAWING NUMBER) | A (REV)

COMPUTER REPRODUCABLE | SCALE: N/A | SHEET 1 OF 1

JOB NUMBER | USED ON DWG. NO.

LT-EL-BL-EI-HCH-2060

National Synchrotron Light Source

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managed by Brookhaven Science Associates
for the U.S. Department of Energy

Memo

Date: January 10, 2016
To: George Ganetis, and Scott Buda
From: Zhong Zhong (chair), NSLS II Radiation Safety Committee
Subject: Radiation Safety Committee endorsement of the PPS design of 2-ID (SIX) and 6-BM (BMM) beamlines

Dear George and Scott

I would like to thank you for inviting the RSC sub-committee for PPS (personal protection system) interlock, Mohamed Benmerrouche, Dana Beavis, Robert Lee, and myself, to the review of the PPS logic diagrams for 2-ID (SIX) and 6-BM (BMM) beamlines.

We reviewed the logic diagrams, sent beforehand, for both beamlines. We then met with Scott Buda and George Ganetis on December 16, 2016 to discuss the drawings and provide feedback.

SIX, a soft x-ray scattering and spectroscopy beamline, consists of the FOE, pink-beam transport and monochromator on the experimental floor interlocked via vacuum-switches, and an experimental enclosure/endstation in a separate building outside of the storage ring.

6-BM, a hard x-ray spectroscopy beamline using a 3PW source, consists of FOE, monochromatic beam transport on the experimental floor, and an experimental enclosure. 6-BM interlocks include PPS-interlocking of the water flow for the monochromator and pink beam-stop, both in the FOE. The necessity of water-interlock for devices using 3PW as source was discussed.

The drawings for 2-ID were revised by Scott Buda, to show the water interlock in the permit string, according to our suggestions and were e-mailed to us on December 16.

While the IWG should be the primary reviewer for interlock logic diagrams, the RSC brings in broader expertise in areas such as radiation physics and PS shielding policy. This review by the RSC sub-committee compliments the shielding and ray-tracing reviews in the future for both beamlines by the RSC.

As a result of the sub-committee review, the RSC concurs that the PPS designs of 2-ID and 6-BM beamlines meet Photon Sciences shielding policy.

Radiation Safety Committee

Name	*Expertise*	*Directorate*
Andrew Ackerman	Deputy ESH Manager	PS
Andi Barbour	Beam Line Physicist	PS
Dana Beavis	Experimental Nuclear Particle Physics	NPP
Mohamed Benmerrouche	Nuclear and Radiation Physics	PS
Scott Buda	Personnel Protective Systems	PS
Ray Fliller	Accelerator Physicist	PS
Wah-Keat Lee	Beam Line Physicist	PS
Boris Podobedov	Accelerator Physics	PS
Chuck Schaefer	Accelerator SME	ESH
Om Singh	Accelerator Controls	PS
Lutz Wiegart	Beam Line Physicist	PS
Zhong Zhong	Beam Line Physicist	PS
Emil Zitvogel	Accelerator Operations	PS
Ashley Shoemaker-Skokov	Administrative Support	PS

Ray-tracing sub-committee

Andrew Ackerman	Deputy ESH Manager	PS
Mary Carlucci-Dayton	Mechanical Engineer	PS
Wah-Keat Lee	Beam Line Physicist	PS
Chuck Schaefer	Accelerator SME	ESH
Christopher Stelmach	Designer	PS
Lutz Wiegart	Beam Line Physicist	PS
Zhong Zhong	Beam Line Physicist	PS

PPS sub-committee

Dana Beavis	Experimental Nuclear Particle Physics	NPP
Mohamed Benmerrouche	Nuclear and Radiation Physics	PS
Scott Buda	Personnel Protective Systems	PS
Robert Lee	ESH manager	PS
Zhong Zhong	Beam Line Physicist	PS

NSLS-II Beamline 6-BM Radiological Interlock Test Checklist

Test Reason: Initial Test	Test Result: ☑ Passed ☐ Failed Test Type: ☐ Pre-Certification ☑ Certification ☐ Partial
Test Date: 3/6 - 3/8/17	Start Time: Finish Time:
Tester 1: Thomas McDonald; Brian Heneveld	Assistant 1: Accelerator Operations Staff
Tester 2: Robert Chmiel; Gabrielle Stave	Assistant 2:
Tester 1 Signature: Thomas P. McDonald	Tester 2 Signature: Robert Chmiel
*Reviewer 1:	Reviewer 1 Signature:
Reviewer 2:	Reviewer 2 Signature:
** Safety Signature 6-BM (Beamline HMI) A Chain: 65E11DIC B Chain: 27C282BE	Previous 6-BM SS# Date: / / A Chain: B Chain:
** Safety Signature Pentant 3 Beamline (SR HMI) A Chain: 31384F57 B Chain: F66EFF17	Previous Pentant 3 SS# Date: / / A Chain: B Chain:

* A review by an Accelerator Safety Systems Engineer and a designated specialist (Reviewer 2) is only required upon a Test failure.
**If Current Safety Signature number (found in top left corner on HMI) is different from previous number, contact the Accelerator Safety Systems Cognizant Engineer.

PREPARATION:

I. All hutch door switches have been evaluated by NSLS-II Engineering for proper positioning	✓
II. Inform Control Room Lead Operator that testing will be done	✓
III. Obtain Beamline enable and PPS reset keys from Control Room	✓
IV. Verify that beamline vacuum and water interlocks are satisfied	✓
V. Place muffler on beam imminent sounder	✓
VI. Request Lead Operator enable Master shutters	✓

A1 ***Verify System Lockouts***

Gun HVPS Enable Switch ✓

Linac modulator line cords (3) OR Booster Dipole F PS 480 V ✓

Booster RF HVPS 480 V OR Booster low level RF drive termination ✓

SR System C low level RF drive termination OR SR System C RF output connection to cavity ✓

SR System D low level RF drive termination OR SR System D RF output connection to cavity ✓

A2 ***Verify Search and Time Beam Imminent Alarm***

Verify that search path is free from obstacles and line of sight is clear in search mirrors in accordance with PS-C-XFD-PRC-010, *Beamline Enclosure Search and Secure and Breaking Security Procedure* ✓

Repeat steps for each 6-BM hutch.	A	B
Close all doors except the main door	✓	✓
"Entry Permitted" sign ON	✓	✓
Using the keypad, lock the closed doors	✓	✓
Press SB1	✓	✓
SB1 illuminates	✓	✓
Search sounder sounds	✓	✓
Search yellow beacon flashing	✓	✓
Press SB2	✓	✓
SB2 illuminates	✓	✓
Exit hutch and close main door	✓	✓
Press SBE and ***begin timing***	✓	✓
Beam imminent alarm sounds for 30 seconds	✓	✓
After warning, (FOE, B) Interlocked A and B ON (**green**), HMI	✓	✓
"Interlocked" sign ON	✓	✓
Maglock A and B ON (**green**), all doors, HMI	✓	✓
Press the SBE/Access Button	✓	✓
"Interlocked" sign OFF, "Entry Permitted" sign ON	✓	✓
FOE, B Interlocked A and B OFF, HMI	✓	✓
Maglock A OFF (may require opening Maglock on keypad)	✓	✓
Open door	✓	✓
Door opens, Maglock B OFF	✓	✓

A3 ***Out of Sequence Search in the FOE (A Hutch) and B Hutch***

Repeat steps for each 6-BM hutch.	A	B
Press SB2	✓	✓
SB2 does not illuminate	✓	✓
Press SB1	✓	✓

SB1 illuminates	✓	✓
Close hutch door and press SBE	✓	✓
Hutch does NOT secure	✓	✓

A4 ***Search Timeout***

Repeat steps for each 6-BM hutch.	A	B
Press first search button and ***begin timing***	✓	✓
Complete search ***without pressing Final Search button***	✓	✓
Search sounders off in 2 minutes	✓	✓
Press Final Search button	✓	✓
Search does not complete	✓	✓

A5 ***Shutter Enable***

Place actuators on FOE door switches and attach Maglock devices		✓
	Beamline Online A and B OFF	✓
Enable beamline with key and perform a reset	Beamline Online A and B ON (**green**)	✓
Search the FOE	FE Shutter Permits A and B ON ***after*** Beam Imminent Warning	✓
Open FE Shutters	FE Shutters A and B indicate open (**green**)	✓
	"Beam On" sign is ON	✓
Close FE Shutters	FE Shutters A and B indicate closed (**red**)	✓
	"Beam On" sign is OFF	✓

A6 ***Emergency Stops (ES) FOE (A Hutch)***

For each ES search FOE hutch.	ES1	ES2	ES3	ES4
Open FE Shutters from keypad	✓	✓	✓	✓
FE Shutters A and B open (**green**)	✓	✓	✓	✓
FOE Interlocked A and B ON (**green**)	✓	✓	✓	✓
FE Shutter Permits A and B ON (**green**)	✓	✓	✓	✓
FE Critical Device Permits A and B ON	✓	✓	✓	✓
Right Maglock A ON (**green**)	✓	✓	✓	✓

Left Maglock A ON (**green**)	✓	✓	✓	✓
Press ES	✓	✓	✓	✓
FE Shutters A and B closed (**red**)	✓	✓	✓	✓
FOE Interlocked A and B OFF	✓	✓	✓	✓
FE Shutter Permits A and B OFF	✓	✓	✓	✓
FE Critical Device Permits A and B OFF	✓	✓	✓	✓
Right Maglock A OFF	✓	✓	✓	✓
Left Maglock A OFF	✓	✓	✓	✓
Pull out ES	✓	✓	✓	✓
ES Sum Latch OFF	✓	✓	✓	✓
Reset fault	✓	✓	✓	✓
ES Sum Latch ON (**green**)	✓	✓	✓	✓

A7 ***Emergency Stops (ES) B Hutch***

For each ES search hutch.	**ES1**	**ES2**	**ES3**
Open FE and L1S1 Shutters from keypad	✓	✓	✓
All Shutters A and B open (**green**)	✓	✓	✓
B Interlocked A and B ON (**green**)	✓	✓	✓
L1S1 Shutter Permit A and B ON (**green**)	✓	✓	✓
FE Critical Device Permits A and B ON	✓	✓	✓
Right Maglock A ON (**green**)	✓	✓	✓
Left Maglock A ON (**green**)	✓	✓	✓
Press ES	✓	✓	✓
L1S1 Shutter A and B closed (**red**)	✓	✓	✓
B Interlocked A and B OFF	✓	✓	✓
L1S1 Shutter Permit A and B OFF	✓	✓	✓
FE Critical Device Permits A and B OFF	✓	✓	✓
Right Maglock A OFF	✓	✓	✓
Left Maglock A OFF	✓	✓	✓

Pull out ES	✓	✓	✓
ES Sum Latch OFF	✓	✓	✓
Reset fault	✓	✓	✓
ES Sum Latch ON (**green**)	✓	✓	✓

A8 ***FOE Hutch Labyrinth 1 Switches and Latches***

Place actuators on the labyrinth switches/latches and downstream left door switches and Maglock. ✓

Check the corresponding Permits for each switch tested (e.g., A Permit for switch A1).

	A	B	Latch
Search hutch	✓	✓	✓
Open FE Shutters from keypad	✓	✓	✓
FE Shutters A and B open (**green**)	✓	✓	✓
FOE Interlocked A and B ON (**green**)	✓	✓	✓
FE Shutter Permits A and B ON (**green**)	✓	✓	✓
Cable Lab 1 Switches/Latch A and B ON (**green**)	✓	✓	✓
FE Critical Device Permits A and B ON	✓	✓	✓
Remove one switch actuator	✓	✓	✓
FE Shutters A and B closed (**red**)	✓	✓	✓
FOE Interlocked OFF	✓	✓	✓
FE Shutter Permit OFF	✓	✓	✓
Cable Lab 1 Switch/Latch Permit OFF	✓	✓	✓
FE Critical Device Permits A and B OFF	✓	✓	✓
Replace switch actuator and reset fault	✓	✓	✓

Remove labyrinth actuators and close labyrinth door ✓

A9 ***B Hutch Labyrinth 1 Switches and Latches***

Place actuators on the labyrinth switches/latches and downstream left door switches and Maglock. ✓

Check the corresponding Permits for each switch tested (e.g., A Permit for switch A1).

	A	B	Latch
Search hutch	✓	✓	✓
Open FE and LIS1 Shutters from keypad	✓	✓	✓
All Shutters A and B open (**green**)	✓	✓	✓

B Interlocked A and B ON (**green**)	✓	✓	✓
L1S1 Shutter Permit A and B ON (**green**)	✓	✓	✓
Cable Lab 1 Switches/Latch A and B ON (**green**)	✓	✓	✓
FE Critical Device Permits A and B ON	✓	✓	✓
Remove one switch actuator	✓	✓	✓
L1S1 Shutter A and B closed (**red**)	✓	✓	✓
B Interlocked OFF	✓	✓	✓
L1S1 Shutter Permit OFF	✓	✓	✓
Cable Lab 1 Switch/Latch Permit OFF	✓	✓	✓
FE Critical Device Permits A and B OFF	✓	✓	✓
Replace switch actuator and reset fault	✓	✓	✓
Remove labyrinth actuators and close labyrinth door			✓

A10 ***FOE Right Door Switches***

Place actuators on the door switches and Maglock. ✓

Check the corresponding Permits for each switch tested (e.g., A Permit for switch A1).

	A	B	Reed
Search hutch	✓	✓	✓
Open FE Shutters from keypad	✓	✓	✓
FE Shutters A and B open (**green**)	✓	✓	✓
FOE Interlocked A and B ON (**green**)	✓	✓	✓
FE Shutter Permits A and B ON (**green**)	✓	✓	✓
FOE Door Switch Sum A and B ON (**green**)	✓	✓	✓
FE Critical Device Permits A and B ON	✓	✓	✓
Remove one switch actuator	✓	✓	✓
FE Shutters A and B closed (**red**)	✓	✓	✓
FOE Interlocked OFF	✓	✓	✓
FE Shutter Permit OFF	✓	✓	✓
FOE Door Switch Sum OFF	✓	✓	✓
FE Critical Device Permits A and B OFF	✓	✓	✓

L1S1 Shutter Permit A and B ON (**green**)	✓	✓	✓
B Door Switch Sum A and B ON (**green**)	✓	✓	✓
FE Critical Device Permits A and B ON	✓	✓	✓
Remove one switch actuator	✓	✓	✓
L1S1 Shutter A and B closed (**red**)	✓	✓	✓
B Interlocked OFF	✓	✓	✓
L1S1 Shutter Permit OFF	✓	✓	✓
B Door Switch Sum OFF	✓	✓	✓
FE Critical Device Permits A and B OFF	✓	✓	✓
Replace switch actuator and reset fault	✓	✓	✓
Remove actuators and close door			✓

A13 ***B Hutch Left Door Switches***

Place actuators on the door switches and Maglock. ✓

Check the corresponding Permits for each switch tested (e.g., A Permit for switch A).

	A	B	Reed
Search hutch	✓	✓	✓
Open FE and L1S1 Shutters from keypad	✓	✓	✓
All Shutters A and B open (**green**)	✓	✓	✓
B Interlocked A and B ON (**green**)	✓	✓	✓
L1S1 Shutter Permit A and B ON (**green**)	✓	✓	✓
B Door Switch Sum A and B ON (**green**)	✓	✓	✓
FE Critical Device Permits A and B ON	✓	✓	✓
Remove one switch actuator	✓	✓	✓
L1S1 Shutter A and B closed (**red**)	✓	✓	✓
B Interlocked OFF	✓	✓	✓
L1S1 Shutter Permit OFF	✓	✓	✓
B Door Switch Sum OFF	✓	✓	✓
FE Critical Device Permits A and B OFF	✓	✓	✓
Replace switch actuator and reset fault	✓	✓	✓
Remove actuators and close door			✓

Replace switch actuator and reset fault	✓	✓	✓	
Remove actuators and close door				✓

A11 ***FOE Left Door Switches***

Place actuators on the door switches and Maglock. ✓

Check the corresponding Permits for each switch tested (e.g., A Permit for switch A).

	A	B	Reed	
Search hutch	✓	✓	✓	
Open FE Shutters from keypad	✓	✓	✓	
FE Shutters A and B open (**green**)	✓	✓	✓	
FOE Interlocked A and B ON (**green**)	✓	✓	✓	
FE Shutter Permits A and B ON (**green**)	✓	✓	✓	
FOE Door Switch Sum A and B ON (**green**)	✓	✓	✓	
FE Critical Device Permits A and B ON	✓	✓	✓	
Remove one switch actuator	✓	✓	✓	
FE Shutters A and B closed (**red**)	✓	✓	✓	
FOE Interlocked OFF	✓	✓	✓	
FE Shutter Permit OFF	✓	✓	✓	
FOE Door Switch Sum OFF	✓	✓	✓	
FE Critical Device Permits A and B OFF	✓	✓	✓	
Replace switch actuator and reset fault	✓	✓	✓	
Remove actuators and close door				✓

A12 ***B Hutch Right Door Switches***

Place actuators on the door switches and Maglock. ✓

Check the corresponding Permits for each switch tested (e.g., A Permit for switch A).

	A	B	Reed
Search hutch	✓	✓	✓
Open FE and L1S1 Shutters from keypad	✓	✓	✓
All Shutters A and B open (**green**)	✓	✓	✓
B Interlocked A and B ON (**green**)	✓	✓	✓

B Interlocked A and B ON (**green**)	✓	✓
L1S1 Shutter Permit A and B ON (**green**)	✓	✓
Door Maglock A and B ON (**green**)	✓	✓
Open FE and L1S1 Shutters	✓	✓
All Shutters open (**green**)	✓	✓
Using FOE test box, turn OFF Maglock	✓	✓
Door Maglock A OFF	✓	✓
L1S1 Shutter closed (**red**)	✓	✓
B Interlocked A OFF	✓	✓
L1S1 Shutter Permit A OFF	✓	✓
Turn On Maglock and reset fault	✓	✓
Search hutch	✓	✓
Using FE Shutter test fixture, Open FE and L1S1 Shutters	✓	✓
FE Critical Device Permits A and B ON	✓	✓
Using FOE test box, turn OFF Maglock	✓	✓
Within 3 seconds:		
FE Critical Device Permit A chain OFF	✓	✓
Close FE Shutters and reset fault	✓	✓
Disconnect FOE test box		✓

A16 ***Water Interlock***

Record the pretest water flows for the PPS meters in GPM.

Meter Reading	Meter Reading	Current STA A	Current STA B
A1= 0.7	B1= 0.73	A STA1= 0.7	B STA1= 0.73

The current programmed trip settings for the amplifiers are in column 1. The STA readouts for each tested A and B chain STAs will be recorded in columns 3 and 4. These recordings should be within 15% of the programmed trip point (column 2).

Trip Points	Trip Points (- 15 %)	Recorded A Trip	Recorded B Trip
PPS 1: 0.5 GPM	0.43 GPM	A STA1= 0.5	B STA1= 0.5

	PPS1
Open FE Shutters	✓
FE Shutters A and B open (**green**)	✓

A14 ***Magnetic Lock Test (FOE)***

Connect the FOE test box to the PPS cabinet. Use the box to turn ON the Maglocks (set switches to "Normal"). ✓

Repeat steps for each door: Right (R) and Left (L)

	R	L
Search hutch	✓	✓
FOE Interlocked A and B ON (**green**)	✓	✓
FE Shutter Permits A and B ON (**green**)	✓	✓
Door Maglock A and B ON (**green**)	✓	✓
Open FE Shutters	✓	✓
FE Shutters open (**green**)	✓	✓
Using FOE test box, turn OFF Maglock	✓	✓
Door Maglock A OFF	✓	✓
FE Shutters closed (**red**)	✓	✓
FOE Interlocked A OFF	✓	✓
FE Shutter Permit A OFF	✓	✓
Turn On Maglock and reset fault	✓	✓
Search hutch	✓	✓
Using FE Shutter test fixture, Open FE Shutters	✓	✓
FE Crtical Device Permits A and B ON	✓	✓
Using FOE test box, turn OFF Maglock	✓	✓
Within 3 seconds:		
FE Critical Device Permit A chain OFF	✓	✓
Close FE Shutters and reset fault	✓	✓

Disconnect FOE test box ✓

A15 ***Magnetic Lock Test (B Hutch)***

Connect the FOE test box to the PPS cabinet. Use the box to turn ON the Maglocks (set switches to "Normal"). ✓

Repeat steps for each door: Right (R) and Left (L)

	R	L
Search hutch	✓	✓

Water Permits A and B ON (**green**), HMI ✓

FE Shutter Permits A and B ON (**green**), HMI ✓

Using the valve, lower water flow to trip point ✓

FE Shutters A and B closed (**red**) ✓

In 5 seconds: FE Shutter Permits A and B OFF, HMI ✓

Water Permits A and B OFF, HMI ✓

Recorded STA A and B levels above; within 15% ✓

Return water flow to pretest values ✓

Water Permits A and B remain OFF, HMI ✓

Reset fault at PPS cabinet ✓

Water Permits A and B ON (**green**), HMI ✓

FE Shutter Permits A and B ON (**green**), HMI ✓

A17 ***Water Safety Test Amplifier Faults***

Open FE Shutters with keypad ✓

FE Shutters A and B open (**green**) ✓

Water Permits A and B ON (**green**), HMI ✓

FE Shutter Permits A and B ON (**green**), HMI ✓

Press A chain fault/reset button ✓

FE Shutters A and B closed (**red**) ✓

Water Permit A OFF, HMI ✓

In 5 seconds: FE Shutter Permit A OFF, HMI ✓

Reset fault ✓

Open FE Shutters with keypad ✓

FE Shutters A and B open (**green**) ✓

Water Permits A and B ON (**green**), HMI ✓

FE Shutter Permits A and B ON (**green**), HMI ✓

Press B chain fault/reset button ✓

FE Shutters A and B closed (**red**) ✓

Water Permit B OFF, HMI ✓

In 5 seconds: FE Shutter Permit B OFF, HMI ✓

Reset fault ✓

A18 ***Observe Beamline Photon Shutter Operation***

Close Beamline Photon Shutter		✓
	Shutter indicates closed A and B (**red**), HMI	✓
Open Beamline Photon Shutter		✓
	Shutter opens smoothly without hesitation	✓
	Shutter indicates open A and B (**green**), HMI	✓
Close Beamline Photon Shutter		✓
	Shutter indicates closed A and B (**red**), HMI	✓

A19 ***Observe FE Safety Shutter(s) Operation***

With Maintenance Door open, connect FE Shutter test fixture.		✓
	Shutters are in the closed (down) position	✓
	FE Shutters A and B closed (**red**), HMI	✓
Turn the "Air" switch ON		✓
Open FE SSs A and B and Photon Shutter	Shutters open freely without hesitation	✓
	Shutters are in the open (up) position	✓
	FE Shutters A and B open (**green**), HMI	✓
Actuate Shutters closed	FE Shutters A and B closed (**red**), HMI	✓

A20 ***FE Safety Shutters can only be Closed if FE Photon Shutter is Closed***

Search hutch	FOE Interlocked A and B ON (**green**), HMI	✓
	FE Critical Device Permits A and B ON (**green**), HMI	✓
Open FE SSA	SSA Open	✓
Open FE Photon Shutter	FE Critical Device Permits A and B OFF, HMI	✓
Close Shutters		✓
Reset fault	FE Critical Device Permits A and B ON (**green**), HMI	✓
Open FE SSB	SSB Open	✓
Open FE Photon Shutter	FE Critical Device Permits A and B OFF, HMI	✓
Close Shutters		✓
Reset fault	FE Critical Device Permits A and B ON (**green**), HMI	✓

A21 ***Beamline Enable Key (Opening Shutter without key trips SR RF and Dipole PS)***

Remove beamline enable key	Beamline Online A and B OFF	✓
Search FOE	FOE Interlocked A and B ON (**green**), HMI	✓
	FE Critical Device Permits A and B ON (**green**), HMI	✓
Using FE Shutter test fixture, Open FE Shutters	FE Critical Device Permits A and B OFF	✓
Using FE Shutter test fixture, Close FE Shutters		✓
Replace beamline enable key and reset faults	Beamline Online A and B ON (**green**)	✓

Live Testing

A22 ***Reach Back FOE Door Switches***

Secure P1 through P5	SR Secure, A and B chain, SR HMI	✓
Place actuators on FOE hutch door switches and Maglock		✓
Search hutch	FOE Interlocked A and B ON (**green**), HMI	✓
	FE Critical Device Permits A and B ON (**green**), HMI	✓
Check Control Room SR HMI (MCR beamline 1)	FE Critical Device Permit A and B ON (**green**), SR HMI	✓
Check I/O Box 6BM Beamline Enable Panel	FE Critical Device Permits A and B LEDs ON	✓
Check I/O Box 28 Beamline Enable Panel	FE Critical Device Permit Sum A and B LEDs ON	✓
Check Dipole PS (positive) Beamline Interface	A and B Permits ON, Dipole PS Pos. Interface	✓
Check Dipole PS (negative) Beamline Interface	A and B Permits ON, Dipole PS Neg. Interface	✓
Check SR RF System C HVPS Beamline Interface	A and B Permits ON, SR RF System C HVPS Interface	✓
Check SR RF System D HVPS Beamline Interface	A and B Permits ON, SR RF System D HVPS Interface	✓
Operator enables SR Dipole PS	SR Dipole PS is ON	✓
Operator enables SR RF System C HVPS	SR RF System C HVPS is ON	✓
Operator enables SR RF System D HVPS	SR RF System D HVPS is ON	✓
Using FE Shutter test fixture, open the FE Shutters (SSA, SSB and Photon)		✓
	FE Shutters open	✓
*Remove an "**A chain**" door switch actuator from beamline hutch door*		✓
	FOE Interlocked A OFF, HMI	✓
	FE Critical Device Permit A OFF, HMI	✓

Check I/O Box 6BM Beamline Enable Panel	FE Critical Device Permit A LED OFF	✓
Check I/O Box 28 Beamline Enable Panel	FE Critical Device Permit Sum A LED OFF	✓
Check Control Room SR HMI (MCR beamline 1)	FE Critical Device Permit A OFF (**red**), SR HMI	✓
Check SR RF System C HVPS Beamline Interface	A Permit OFF, SR RF System C HVPS Interface	✓
Check SR RF System D HVPS Beamline Interface	A Permit OFF, SR RF System D HVPS Interface	✓
Check Dipole PS (positive) Beamline Interface	A Permit OFF, Dipole PS Pos. Interface	✓
Check Dipole PS (negative) Beamline Interface	A Permit OFF, Dipole PS Neg. Interface	✓
	SR RF System C HVPS is OFF	✓
	SR RF System D HVPS is OFF	✓
	SR Dipole PS is OFF	✓
Close FE Shutters with FE Shutter test fixture	FE Shutters closed	✓
Replace ***"A chain"*** door switch actuator and reset fault(s)		✓
Search hutch		✓
	FOE Interlocked A and B ON (**green**), HMI	✓
	FE Critical Device Permits A and B ON (**green**), HMI	✓
Check Control Room SR HMI (MCR beamline 1)	FE Critical Device Permit A and B ON (**green**), SR HMI	✓
Check I/O Box 6BM Beamline Enable Panel	FE Critical Device Permits A and B LEDs ON	✓
Check I/O Box 28 Beamline Enable Panel	FE Critical Device Permit Sum A and B LEDs ON	✓
Check Dipole PS (positive) Beamline Interface	A and B Permits ON, Dipole PS Pos. Interface	✓
Check Dipole PS (negative) Beamline Interface	A and B Permits ON, Dipole PS Neg. Interface	✓
Check SR RF System C HVPS Beamline Interface	A and B Permits ON, SR RF System C HVPS Interface	✓
Check SR RF System D HVPS Beamline Interface	A and B Permits ON, SR RF System D HVPS Interface	✓
Operator enables SR Dipole PS	SR Dipole PS is ON	✓
Operator enables SR RF System C HVPS	SR RF System C HVPS is ON	✓
Operator enables SR RF System D HVPS	SR RF System D HVPS is ON	✓
Using FE Shutter test fixture, open the FE Shutters (SSA, SSB and Photon)		✓
	FE Shutters open	✓
Remove "***B chain***" switch actuator	FOE Interlocked B OFF, HMI	✓
	FE Critical Device Permit B OFF, HMI	✓

Check I/O Box 6BM Beamline Enable Panel	FE Critical Device Permit B LED OFF	✓
Check Control Room SR HMI (MCR beamline 1)	FE Critical Device Permit B OFF (**red**), SR HMI	✓
Check I/O Box 28 Beamline Enable Panel	FE Critical Device Permit Sum B LED OFF	✓
Check SR RF System C HVPS Beamline Interface	B Permit OFF, SR RF System C HVPS Interface	✓
Check SR RF System D HVPS Beamline Interface	B Permit OFF, SR RF System D HVPS Interface	✓
Check Dipole PS (positive) Beamline Interface	B Permit OFF, Dipole PS Pos. Interface	✓
Check Dipole PS (negative) Beamline Interface	B Permit OFF, Dipole PS Neg. Interface	✓
	SR Dipole PS is OFF	✓
	SR RF System C HVPS is OFF	✓
	SR RF System D HVPS is OFF	✓
Close FE Shutters with FE Shutter test fixture	FE Shutters closed	✓
Remove beamline hutch switch actuators and Maglock actuator		✓

A23 ***Water Interlock (Live)***

Search FOE	FOE Interlocked A and B ON (**green**), HMI	✓
	FE Shutter Permits A and B ON (**green**), HMI	✓
	FE Critical Device Permits A and B ON (**green**), HMI	✓
Check I/O Box 6BM Beamline Enable Panel	FE Critical Device Permits A and B LEDs ON	✓
Check I/O Box 28 Beamline Enable Panel	FE Critical Device Permit Sum A and B LEDs ON	✓
Check Control Room SR HMI (MCR beamline 1)	FE Critical Device Permit A and B ON (**green**), SR HMI	✓
Check Dipole PS (positive) Beamline Interface	A and B Permits ON, Dipole PS Pos. Interface	✓
Check Dipole PS (negative) Beamline Interface	A and B Permits ON, Dipole PS Neg. Interface	✓
Check SR RF System C HVPS Beamline Interface	A and B Permits ON, SR RF System C HVPS Interface	✓
Check SR RF System D HVPS Beamline Interface	A and B Permits ON, SR RF System C HVPS Interface	✓
Operator enables SR Dipole PS	SR Dipole PS is ON	✓
Operator enables SR RF System C HVPS	SR RF System C HVPS is ON	✓
Operator enables SR RF System D HVPS	SR RF System D HVPS is ON	✓
Using FE Shutter test fixture, turn on air and open SSs then Photon Shutter		✓
	FE Shutters indicate open (**green**), HMI	✓

Using Water trip points in step A16, lower flow to one meter		✓
	Water Permits A and B OFF, HMI	✓
Within 5 seconds	FE Shutter Permits A and B OFF, HMI	✓
	FE Critical Device Permits A and B OFF, HMI	✓
Check I/O Box 6BM Beamline Enable Panel	FE Critical Device Permits A and B LEDs OFF	✓
Check I/O Box 28 Beamline Enable Panel	FE Critical Device Permit Sum A and B LEDs OFF	✓
Check Control Room SR HMI (MCR beamline 1)	FE Critical Device Permit A and B OFF (**red**), SR HMI	✓
Check SR RF System C HVPS Beamline Interface	A and B Permits OFF, SR RF System C HVPS Interface	✓
Check SR RF System D HVPS Beamline Interface	A and B Permits OFF, SR RF System D HVPS Interface	✓
Check Dipole PS (positive) Beamline Interface	A and B Permits OFF, Dipole PS Pos. Interface	✓
Check Dipole PS (negative) Beamline Interface	A and B Permits OFF, Dipole PS Neg. Interface	✓
	SR RF System C HVPS is OFF	✓
	SR RF System D HVPS is OFF	✓
	SR Dipole PS is OFF	✓
Close FE Shutters with FE Shutter test fixture	FE Shutters closed	✓
Return water flow to recorded level		✓
Reset fault(s)		✓

A24 ***Observe All Shutters Closed Sum***

Check I/O Box 28 Beamline Enable Panel	FE Shutters closed A chain light ON	✓
	FE Shutters closed B chain light ON	✓
Using FE Shutter test fixture open both FE SSs and then Photon Shutter		✓
	FE Shutters open (**green**), HMI	✓
Check I/O Box 28 Beamline Enable Panel	FE Shutters closed A chain light OFF	✓
	FE Shutters closed B chain light OFF	✓
Close FE Shutters and remove FE Shutter test fixture		✓

A25 ***Test Completion***

Inspect all hutch doors and labyrinths to ensure all PPS switch and Maglock actuators have been removed	✓
Return Beamline enable key and Beamline PPS reset key to the Control Room	✓
Remove muffler from beam imminent sounder	✓
Ensure PPS cabinets are secure and locked; challenge locks	✓
Remove all LOTO	✓
Inform Lead Operator that testing is complete	✓

- END -

Reviewed by:

3/21/2017

X Ewart Orr

Ewart Orr
Accelerator Safety Systems Engineer
Signed by: Orr, Ewart

3/13/2017

X Robert Chmiel

Robert Chmiel
NSLS-II Safety Officer
Signed by: Chmiel, Robert

Approved by:

3/15/2017

X

Robert Lee
NSLS-II ESH Manager
Signed by: Lee, Robert J

Revision History

Revision	Description	Date
1	First Issue.	08MAR2017

Addendum to 6-BM Initial Radiological Interlock test Certification March 8, 2017

Meter Reading	Meter Reading	Current STA A	Current STA B
A1= 0.53	B1= 0.55	A STA1= 0.53	B STA1= 0.55

The current programmed trip settings for the amplifiers are in column 1. The STA readouts for each tested A and B chain STAs will be recorded in columns 3 and 4. These recordings should be within 15% of the programmed trip point (column 2).

Trip Points	Trip Points (- 15 %)	Recorded A Trip	Recorded B Trip
PPS 1: 0.26 GPM	0.26 GPM	A STA1= 0.25	B STA1= 0.25

	PPS1
Water Permits A and B ON (**green**), HMI	✓
Using the valve, turn water flow to trip point	✓
Water Permits A and B OFF, HMI	✓
Recorded STA A and B levels within 15%	✓
Return water flow to pretest values	✓
Water Permits A and B remain OFF, HMI	✓
Reset fault at PPS cabinet	✓
Water Permits ON (**green**), HMI	✓

Test Result:	☑ Passed	☐ Failed

Tested By: [signature] Date: 7/5/17

Tested By: [signature] Date: 7/5/17

Inspection/Test Record

BROOKHAVEN NATIONAL LABORATORY

Photon Sciences Directorate
National Synchrotron Light Source II

Document Title: **Hutch Door PPS Mechanical Inspection (Caratelli Rolling Door)**

Beamline: 6 BM

Door Location: 6 BM A **Type:** Left / Right
(circle one)

Reference Names / Nomenclature

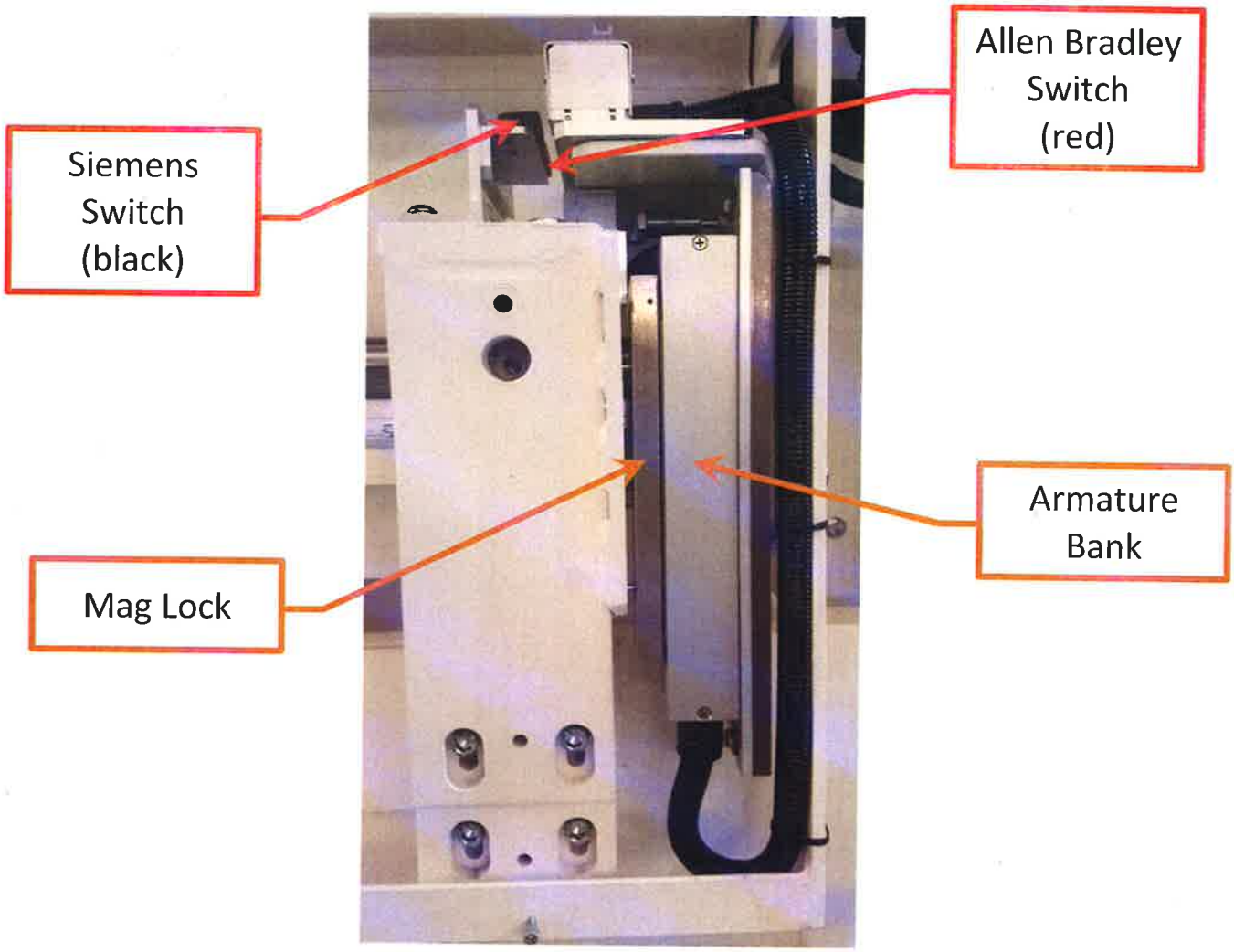

Figure 1a. PPS Lock Shown in Closed Position (Side View)

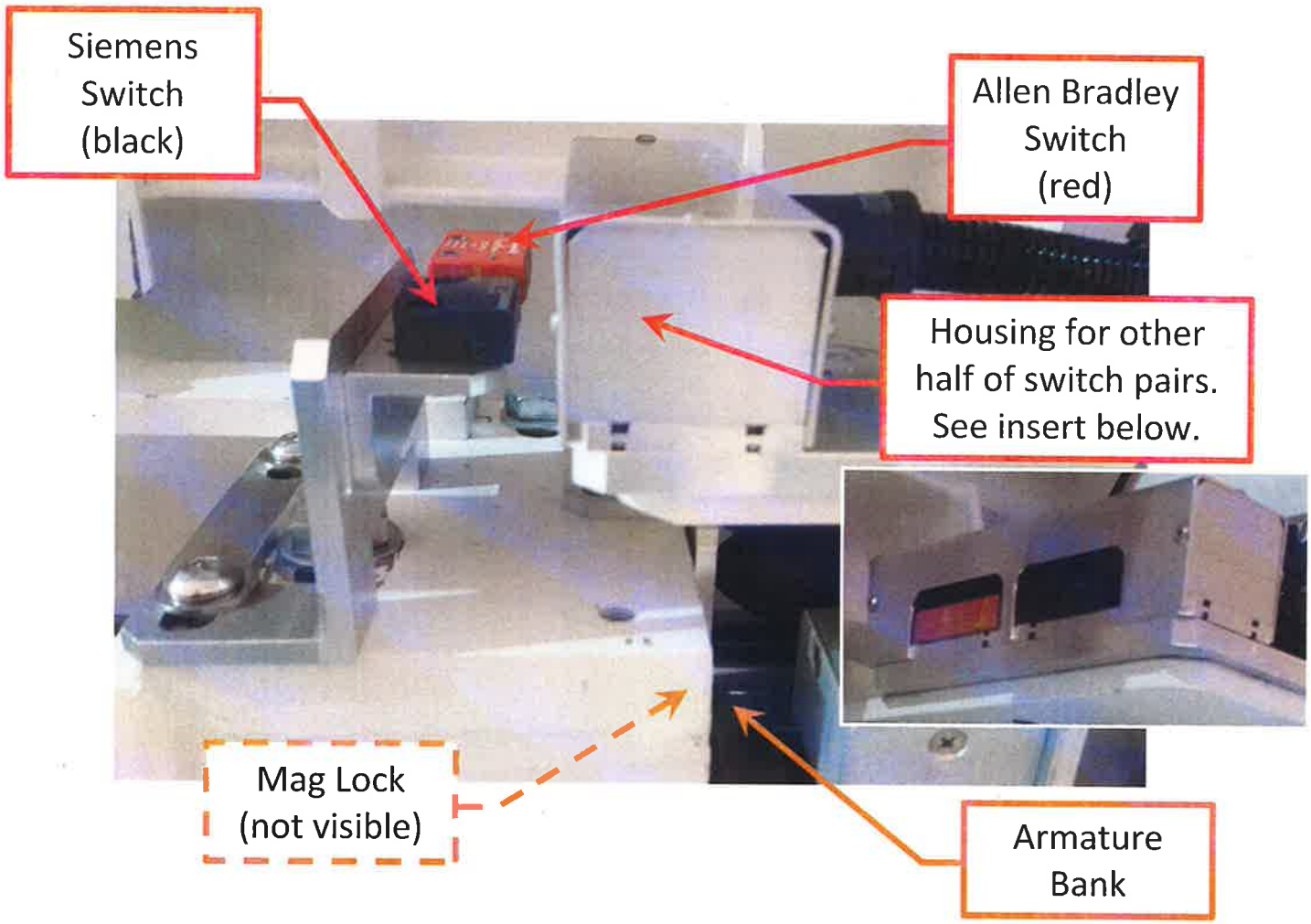

Figure 1b. PPS Lock Shown in Closed Position (Close up of top portion))

(Left-hand door shown above, right-hand is similar, mirror image)

Op #

1) **Close door and ensure there is contact between mag lock and armature bank**

ID	Inspection Description	Pass / Fail	DR #	Name/Life #	Date
1	Contact between Mag Lock and Armature	Pass		Ed Weigand 15372	3-15-17

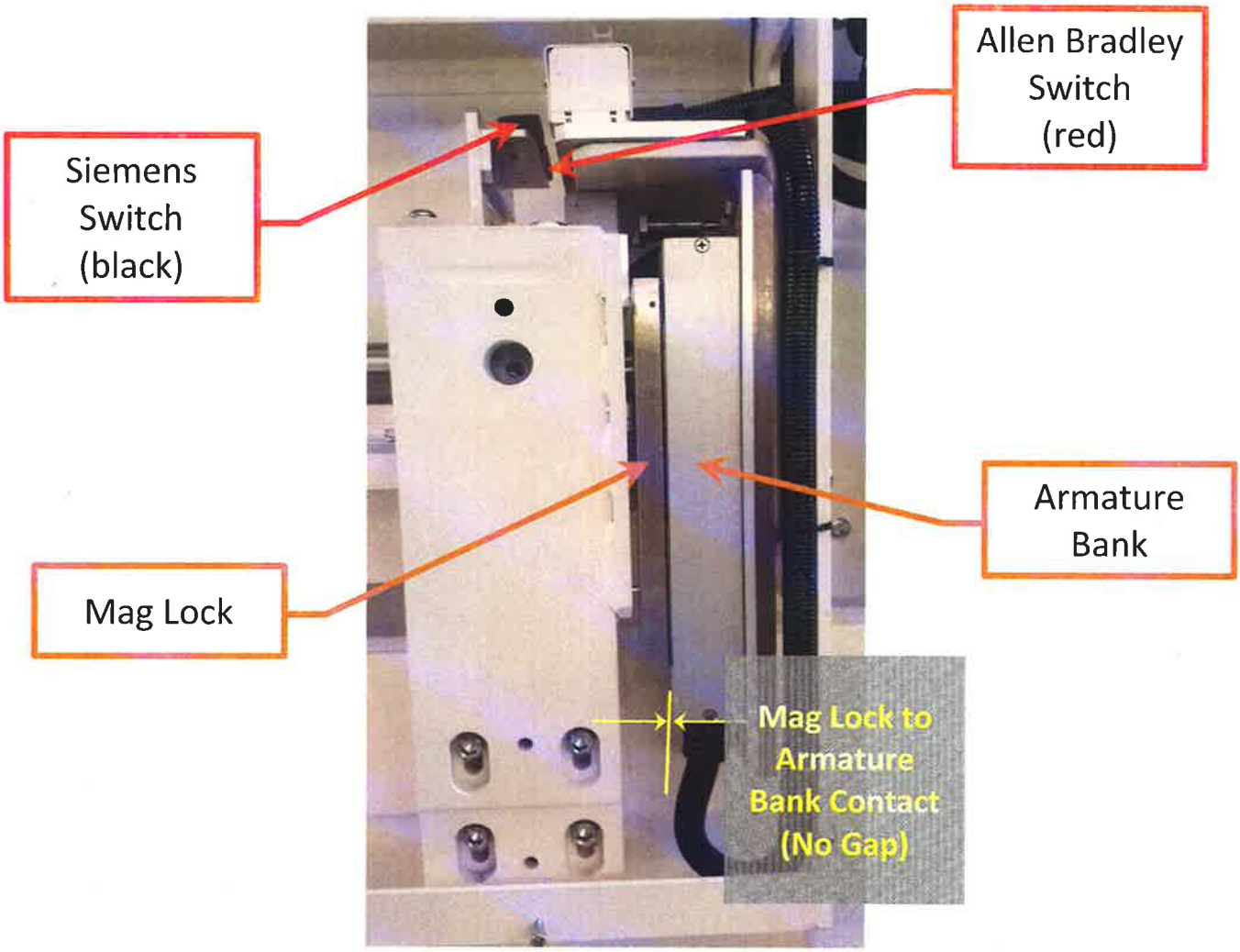

Figure 2. Operation #1: Mag Lock to Armature Gap

2) Use 1/4" precision spacer to set gap between Allen Bradley Switch Halves and Siemens Switch Halves

ID	Inspection Description	CE Nominal Gap	Gap Tolerance	Pass / Fail	DR #	Name/Life #	Date
2	Gap between Switch Halves	~~0.25"~~ EW 0.200	+0.0"/ - 0.003"			Ed Weigand 15372	3-15-17

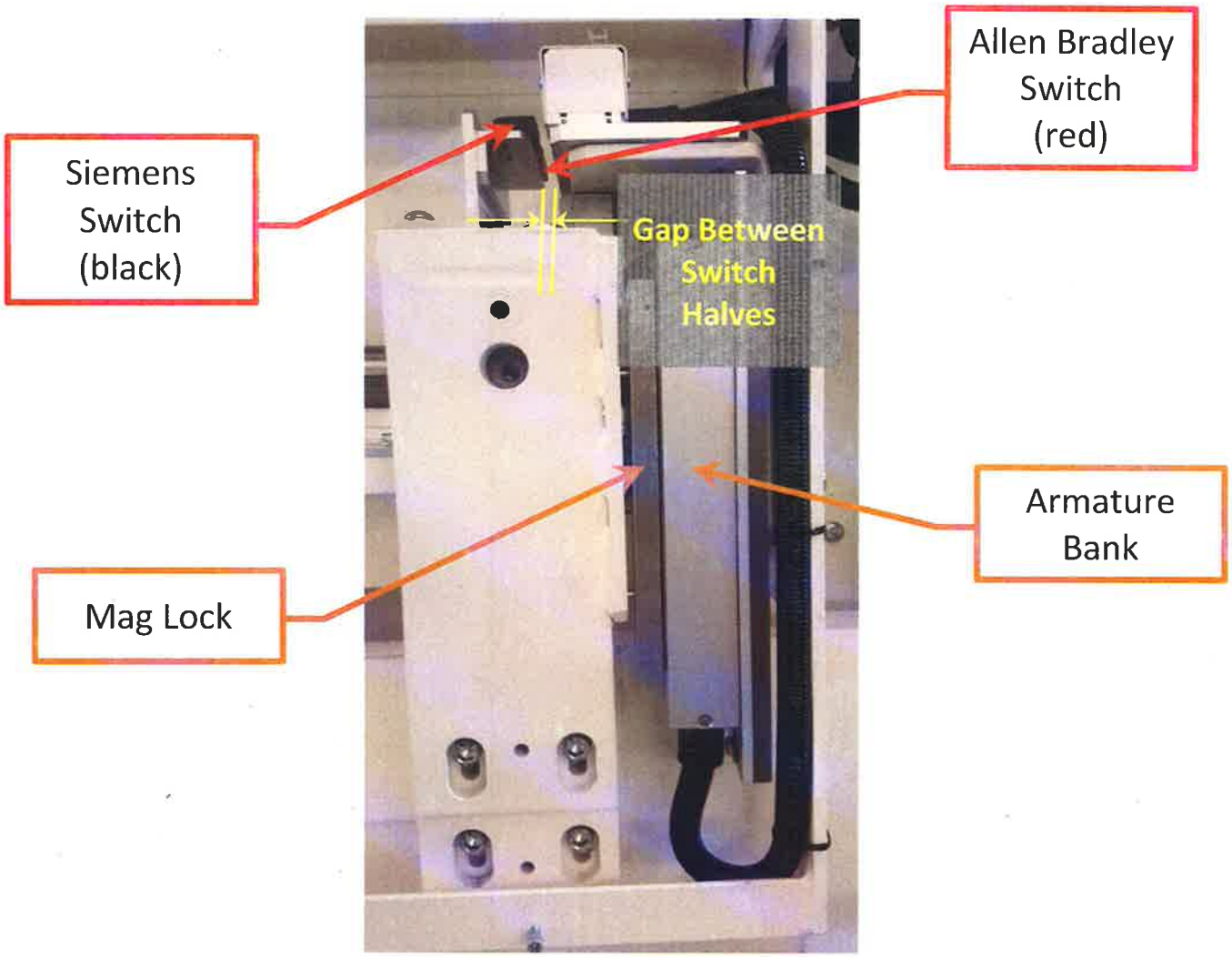

Figure 3. Operation #2: Gap Between Switch Halves

Submitted By: Ed Weigand — *Print Name* — Ed Weigand 3-15-17 — *Signature / Date*

Approvals (ready for certification)

Cognizant Engineer: Christopher Eng — *Approved By (Print Name)* — Christopher G 3-15-17 — *Signature / Date*

Inspection/Test Record

BROOKHAVEN NATIONAL LABORATORY

Photon Sciences Directorate
National Synchrotron Light Source II

Document Title: **Hutch Labyrinth Door PPS Switch Mechanical Inspection Configuration 3**

Beamline: 6 BM A

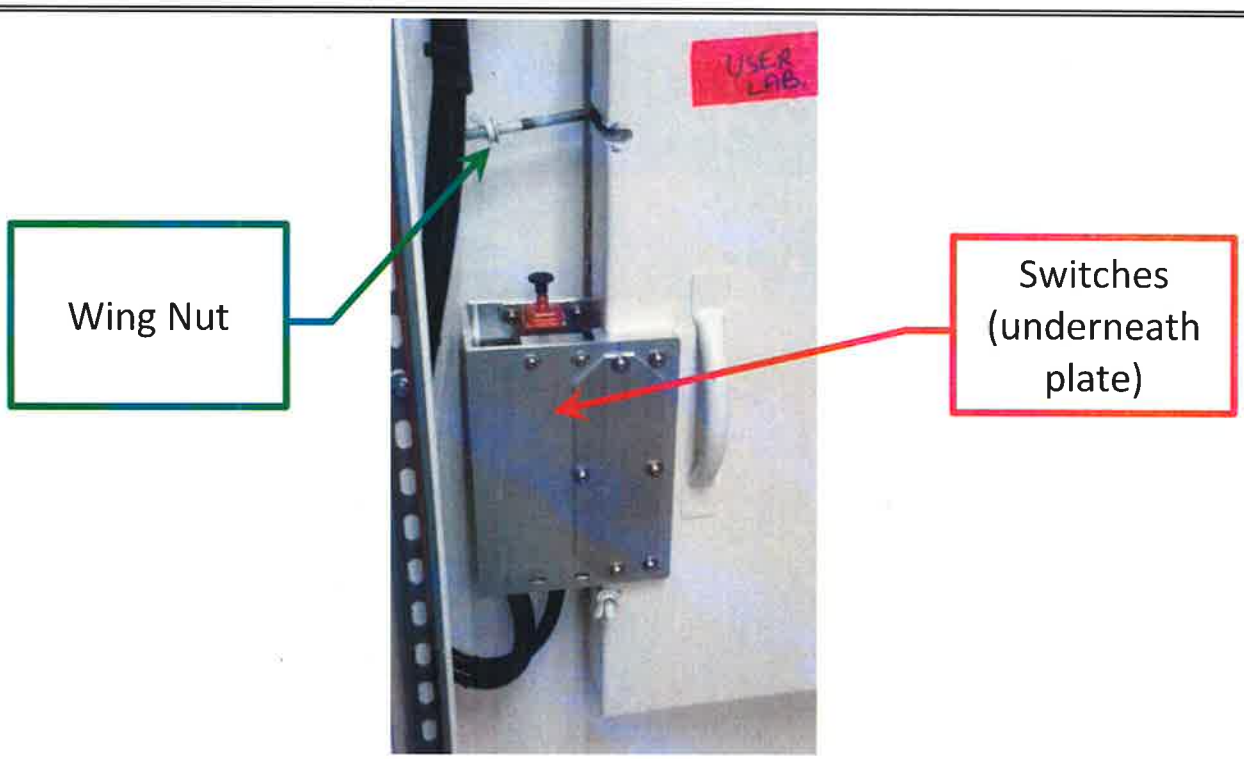

Figure 1. Hutch Wall Labyrinth Door PPS Lock (shown in closed position) (Switches obscured by plate.)

Op #

1) **Close labyrinth door.**

2) **Use precision spacer to set gap between Allen Bradley Switch Halves and Siemens Switch Halves**

ID	Inspection Description	Nominal Gap	Gap Tolerance	Pass / Fail	DR #	Name/Life #	Date
2	Gap between Switch Halves	0.20 "	+0.0"/ - 0.003"	✓		Ed Weigand 15372	3-15-17

Submitted By: Ed Weigand — *Print Name* — Ed Weigand 3-15-17 — *Signature / Date*

Approvals (ready for certification)

Cognizant Engineer: Christopher Ery — *Approved By (Print Name)* — Christopher Ery 3-15-17 — *Signature / Date*

Inspection/Test Record

BROOKHAVEN NATIONAL LABORATORY

Photon Sciences Directorate
National Synchrotron Light Source II

Document Title: **Hutch Door PPS Mechanical Inspection (Caratelli Rolling Door)**

Beamline: 6 BM

Door Location: 6 BM A **Type:** Left / Right *(circle one)*

Reference Names / Nomenclature

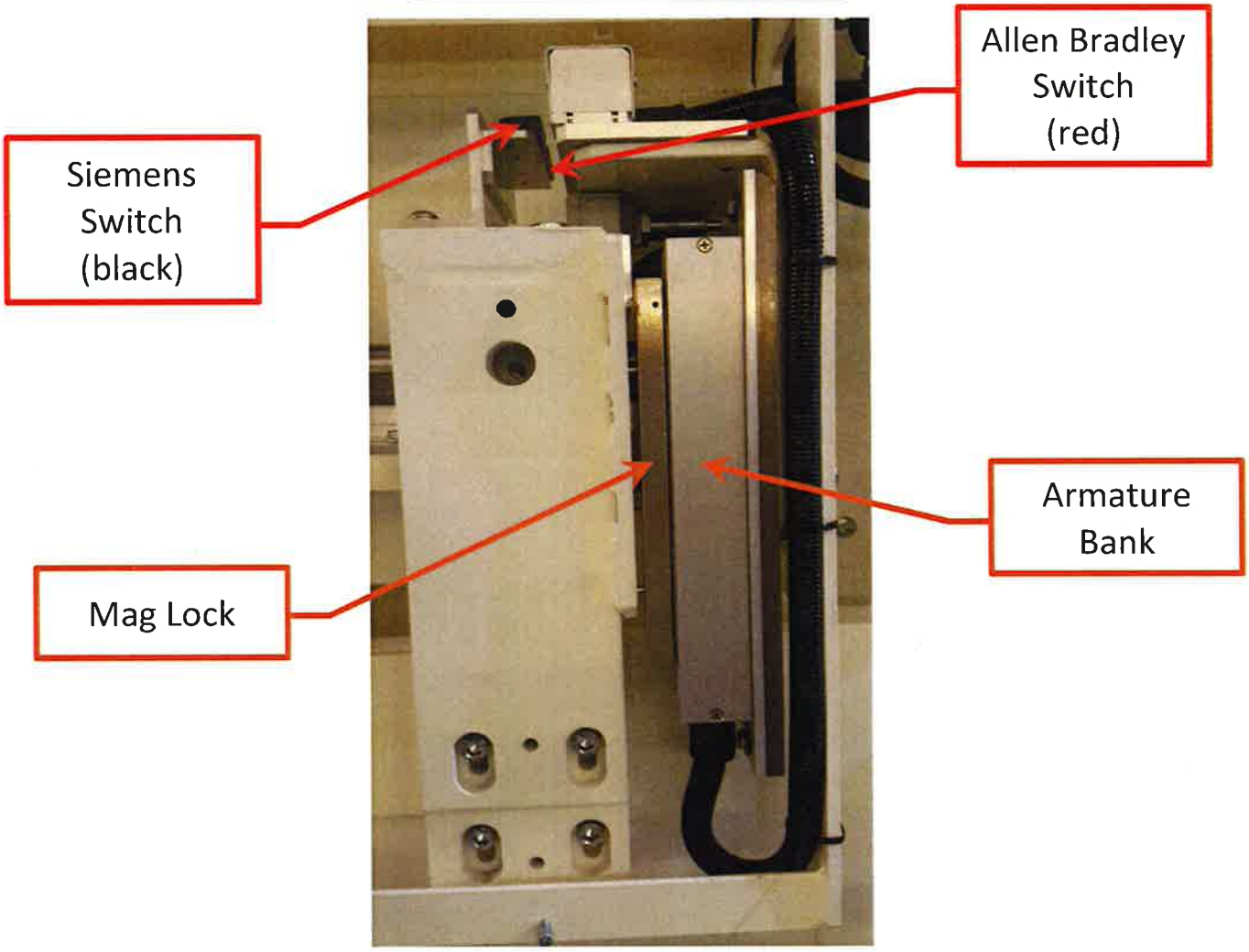

Figure 1a. PPS Lock Shown in Closed Position (Side View)

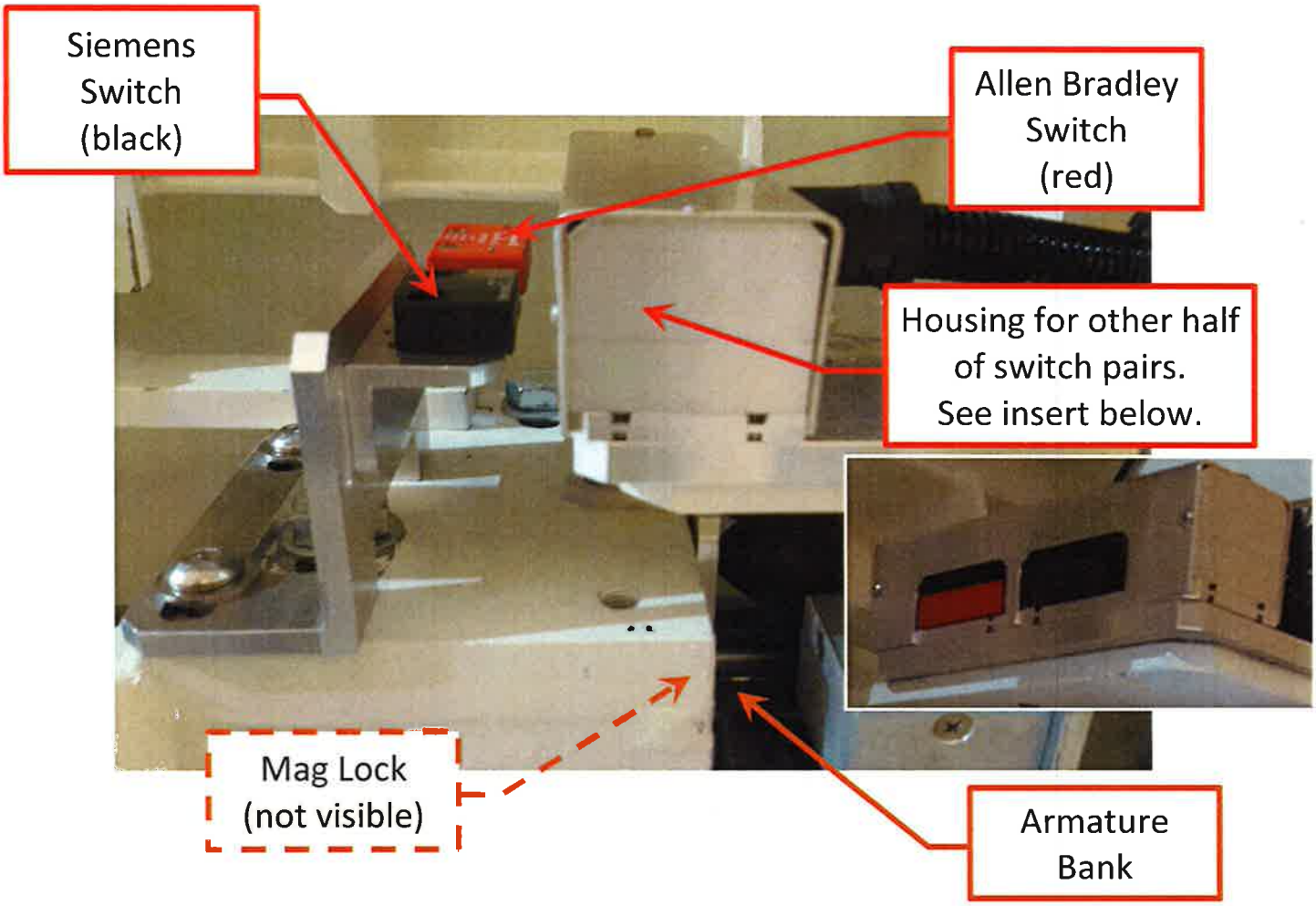

Figure 1b. PPS Lock Shown in Closed Position (Close up of top portion)

(Left-hand door shown above, right-hand is similar, mirror image)

Op #

1) Close door and ensure there is contact between mag lock and armature bank

ID	Inspection Description	Pass / Fail	DR #	Name/Life #	Date
1	Contact between Mag Lock and Armature	✓		Ed Weigand 15372	3-15-17

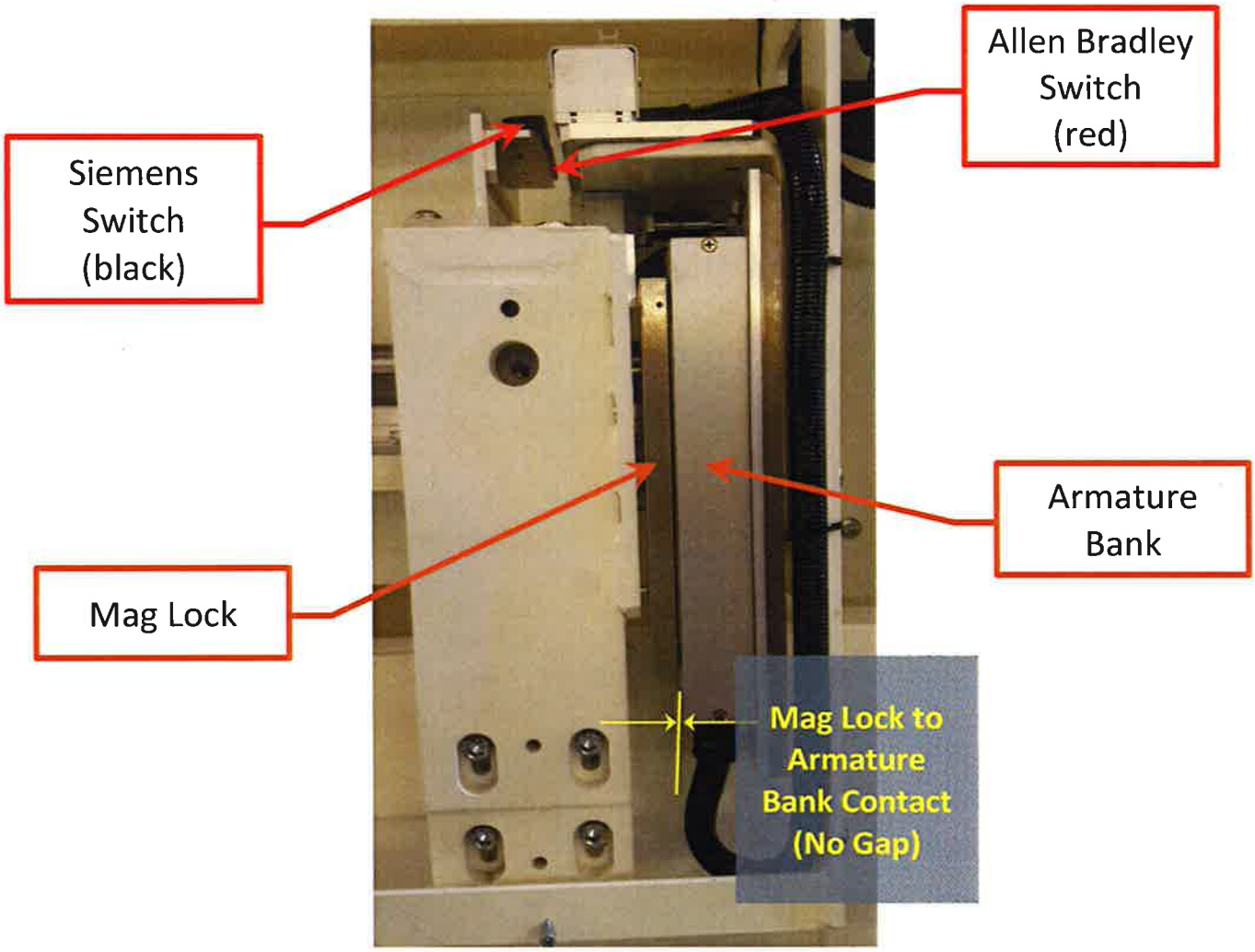

Figure 2. Operation #1: Mag Lock to Armature Gap

2) Use 1/4" precision spacer to set gap between Allen Bradley Switch Halves and Siemens Switch Halves

ID	Inspection Description	Nominal Gap	Gap Tolerance	Pass / Fail	DR #	Name/Life #	Date
2	Gap between Switch Halves	0.20 "	+0.0"/ - 0.003"	✓		Ed Weigand - 5377	3-15-17

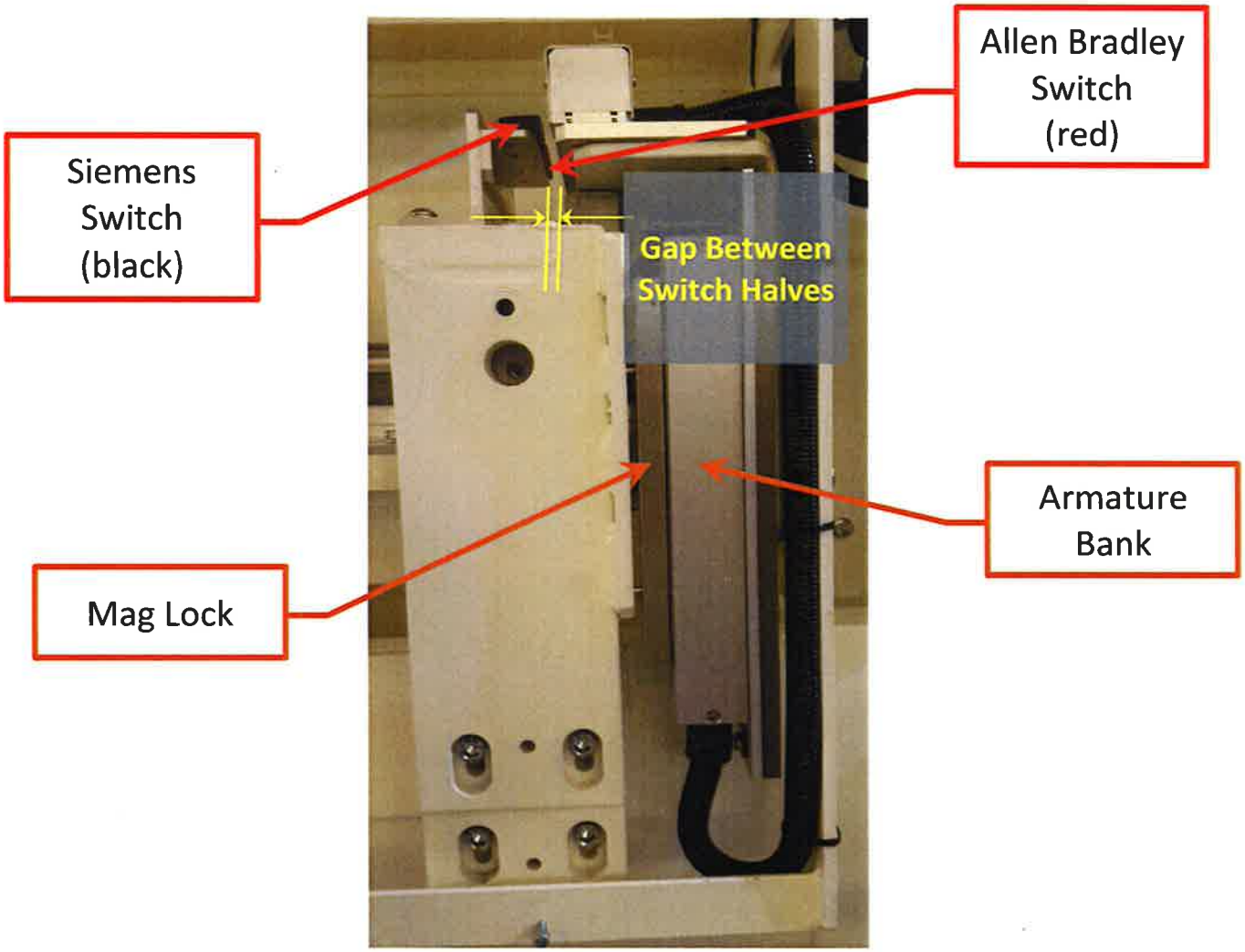

Figure 3. Operation #2: Gap Between Switch Halves

Submitted By: Ed Weigand — *Print Name* — Ed Weigand 3-15-17 — *Signature / Date*

Approvals (ready for certification)

Cognizant Engineer: Christopher Eng — *Approved By (Print Name)* — Christopher Eng 3-17-17 — *Signature / Date*

Inspection/Test Record

BROOKHAVEN NATIONAL LABORATORY

Photon Sciences Directorate
National Synchrotron Light Source II

Document Title: **Hutch Door PPS Mechanical Inspection (Caratelli Rolling Door)**

Beamline: 6 B m

Door Location: 6 B m B **Type:** Left / Right
(circle one)

Reference Names / Nomenclature

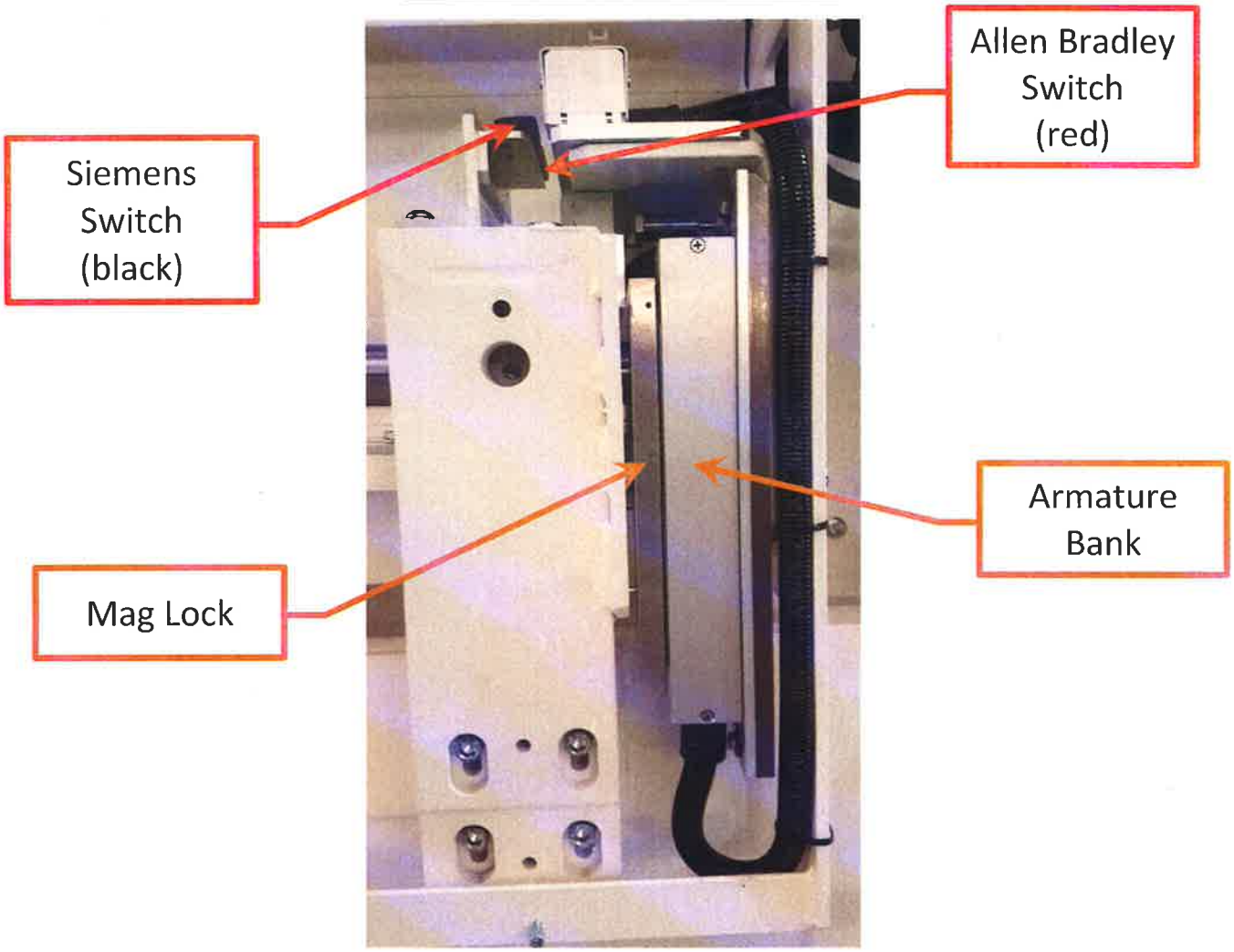

Figure 1a. PPS Lock Shown in Closed Position (Side View)

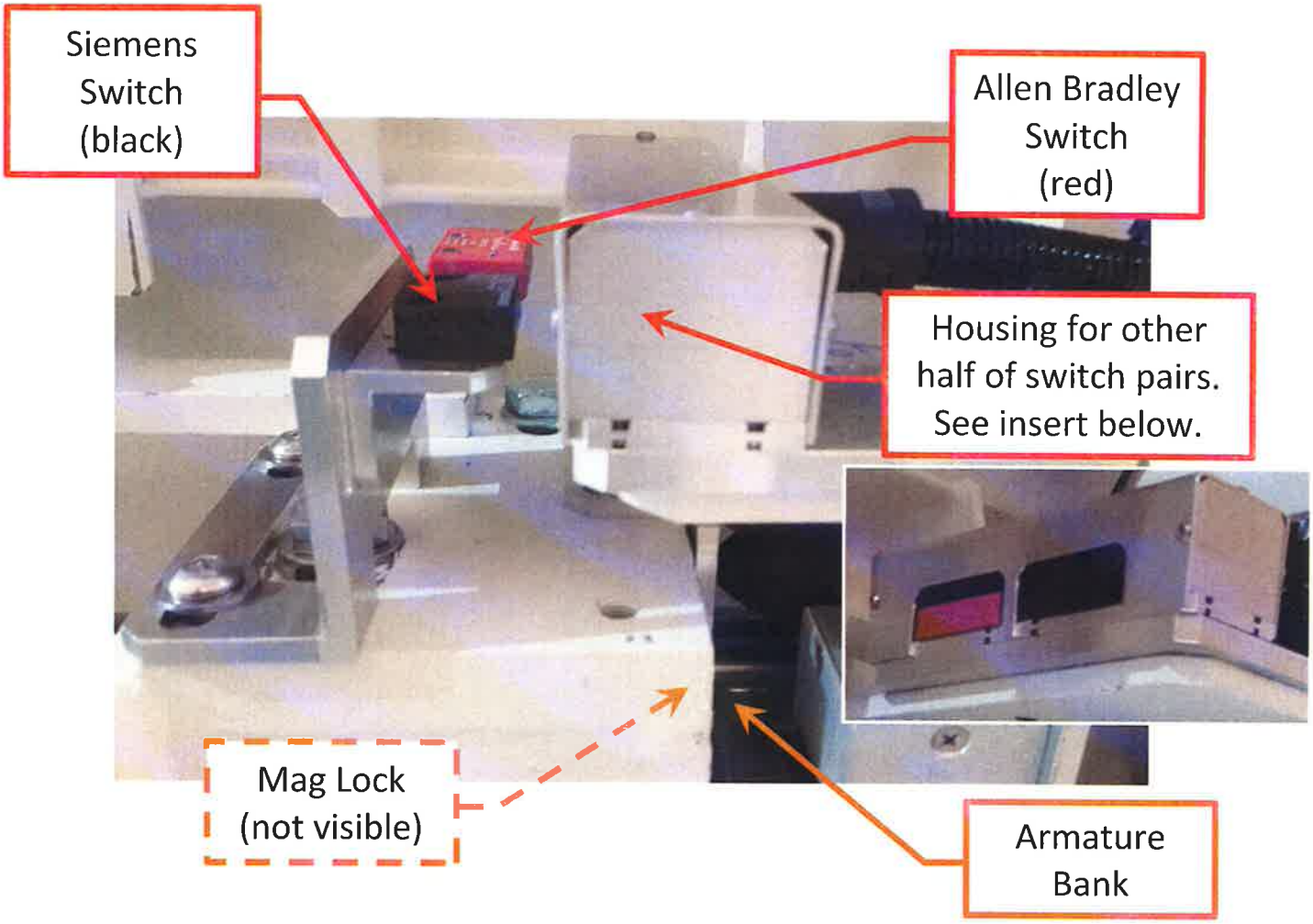

Figure 1b. PPS Lock Shown in Closed Position (Close up of top portion)

(Left-hand door shown above, right-hand is similar, mirror image)

Op #

1) **Close door and ensure there is contact between mag lock and armature bank**

ID	Inspection Description	Pass / Fail	DR #	Name/Life #	Date
1	Contact between Mag Lock and Armature			Ed Weigand 15372	3-15-17

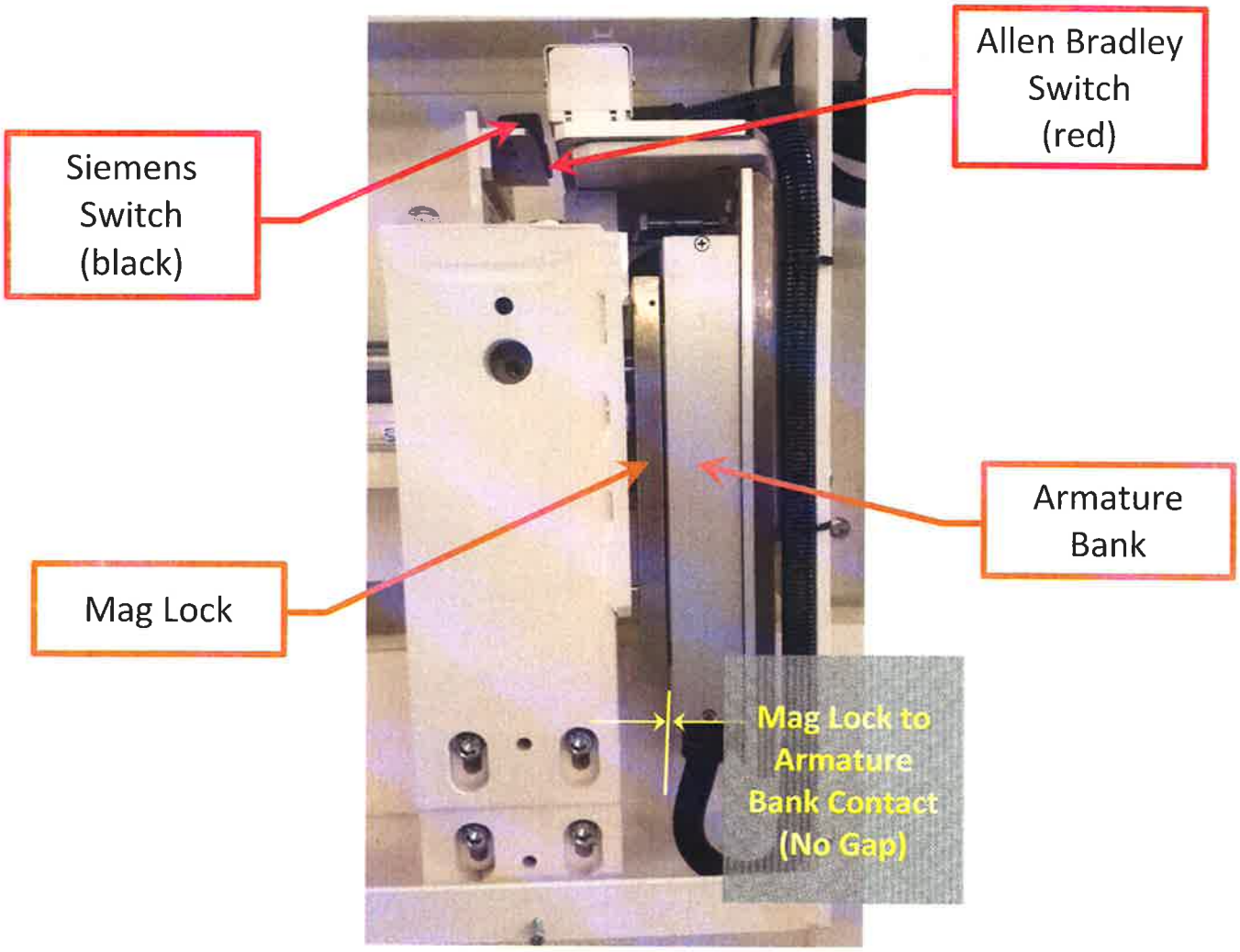

Figure 2. Operation #1: Mag Lock to Armature Gap

2) Use 1/4" precision spacer to set gap between Allen Bradley Switch Halves and Siemens Switch Halves

ID	Inspection Description	Nominal Gap	Gap Tolerance	Pass / Fail	DR #	Name/Life #	Date
2	Gap between Switch Halves	0.20 "	+0.0"/ - 0.003"			Ed Weigand 15372	3-15-17

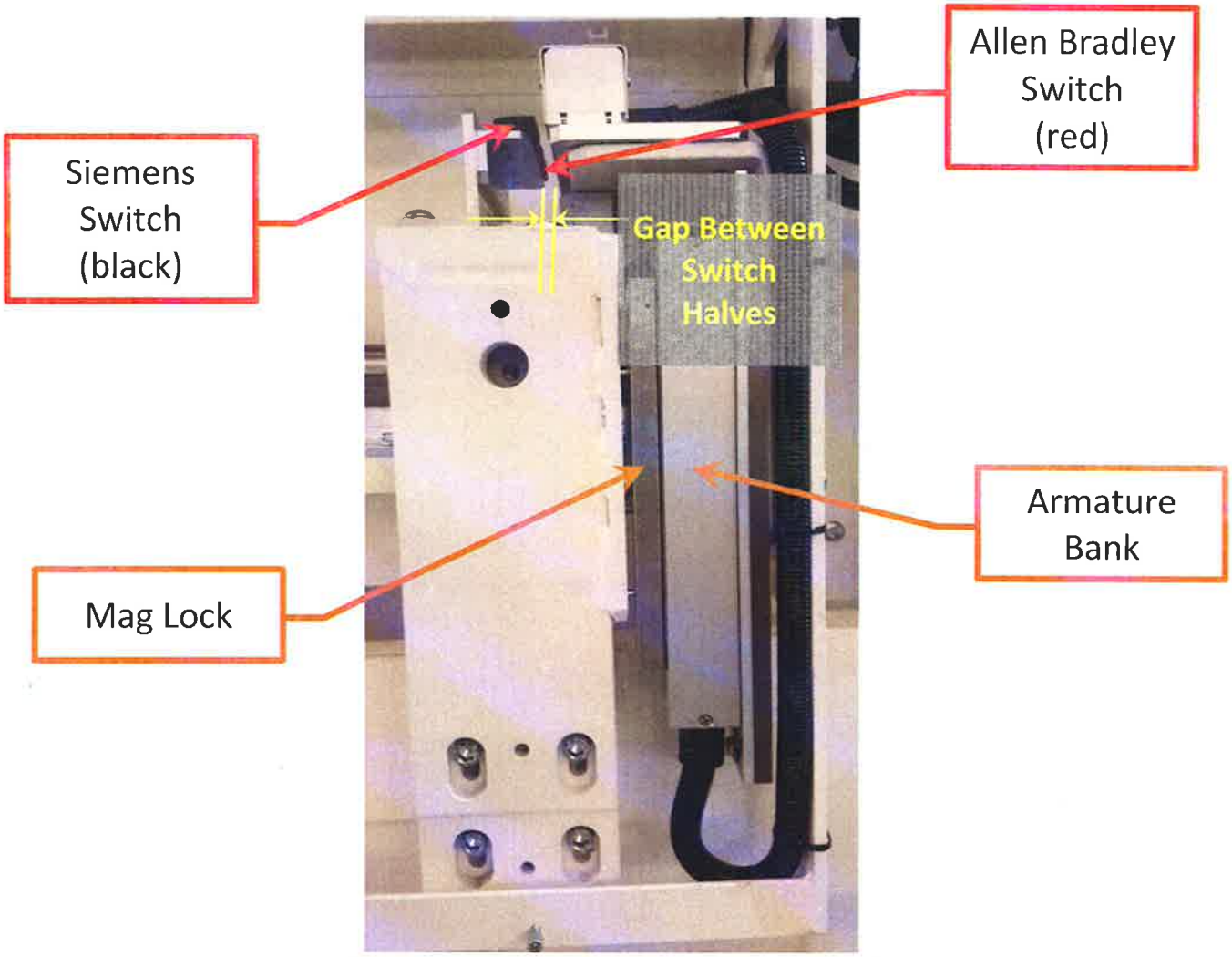

Figure 3. Operation #2: Gap Between Switch Halves

Submitted By: Ed Weigand — *Print Name* — Ed Weigand 3-15-17 — *Signature / Date*

Approvals (ready for certification)

Cognizant Engineer: Christopher Eng — *Approved By (Print Name)* — 3-17-17 — *Signature / Date*

Inspection/Test Record

BROOKHAVEN NATIONAL LABORATORY

Photon Sciences Directorate
National Synchrotron Light Source II

Document Title: **Hutch Door PPS Mechanical Inspection (Caratelli Rolling Door)**

Beamline: 6 Bm

Door Location: 6 Bm B **Type:** Left / Right
(circle one)

Reference Names / Nomenclature

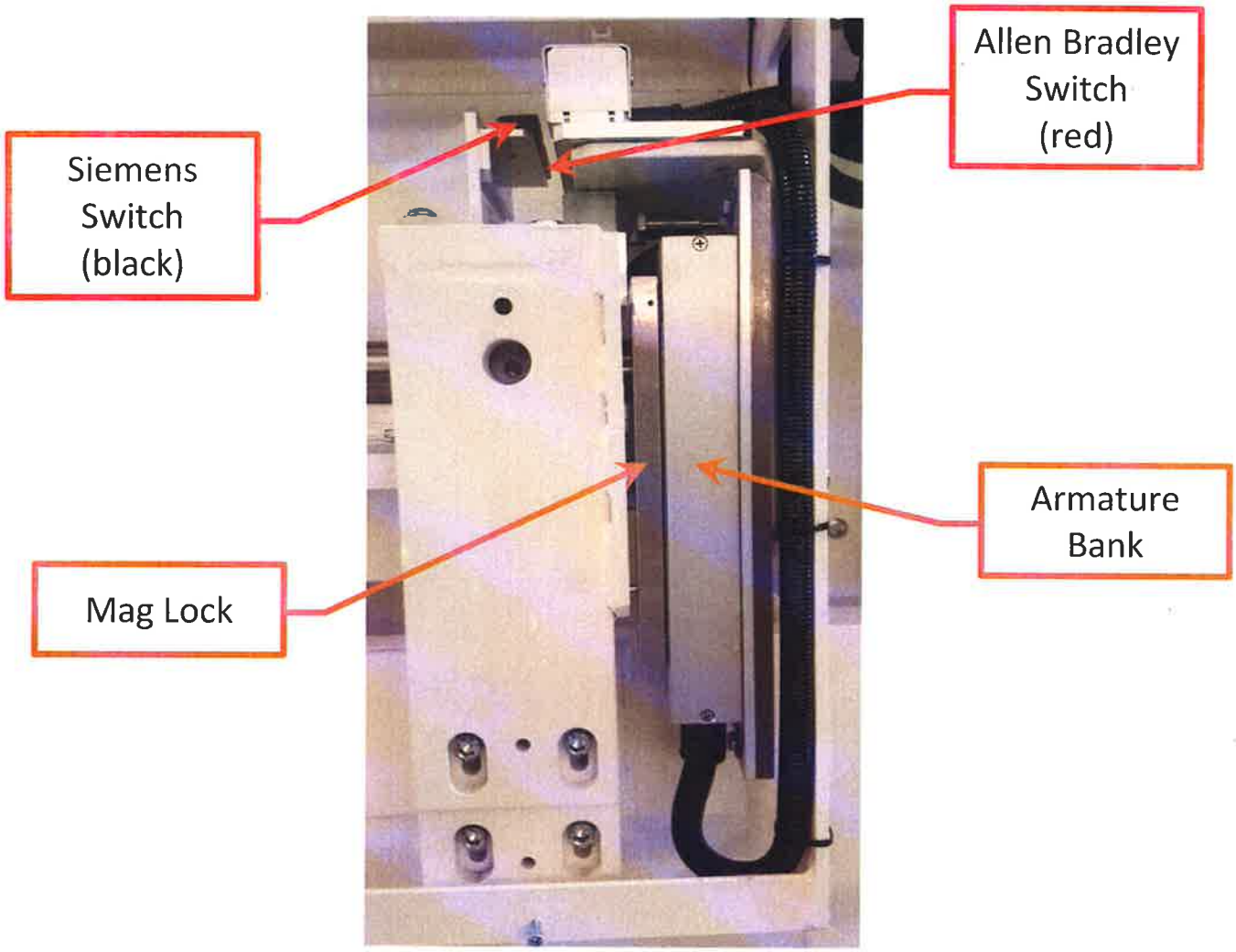

Figure 1a. PPS Lock Shown in Closed Position (Side View)

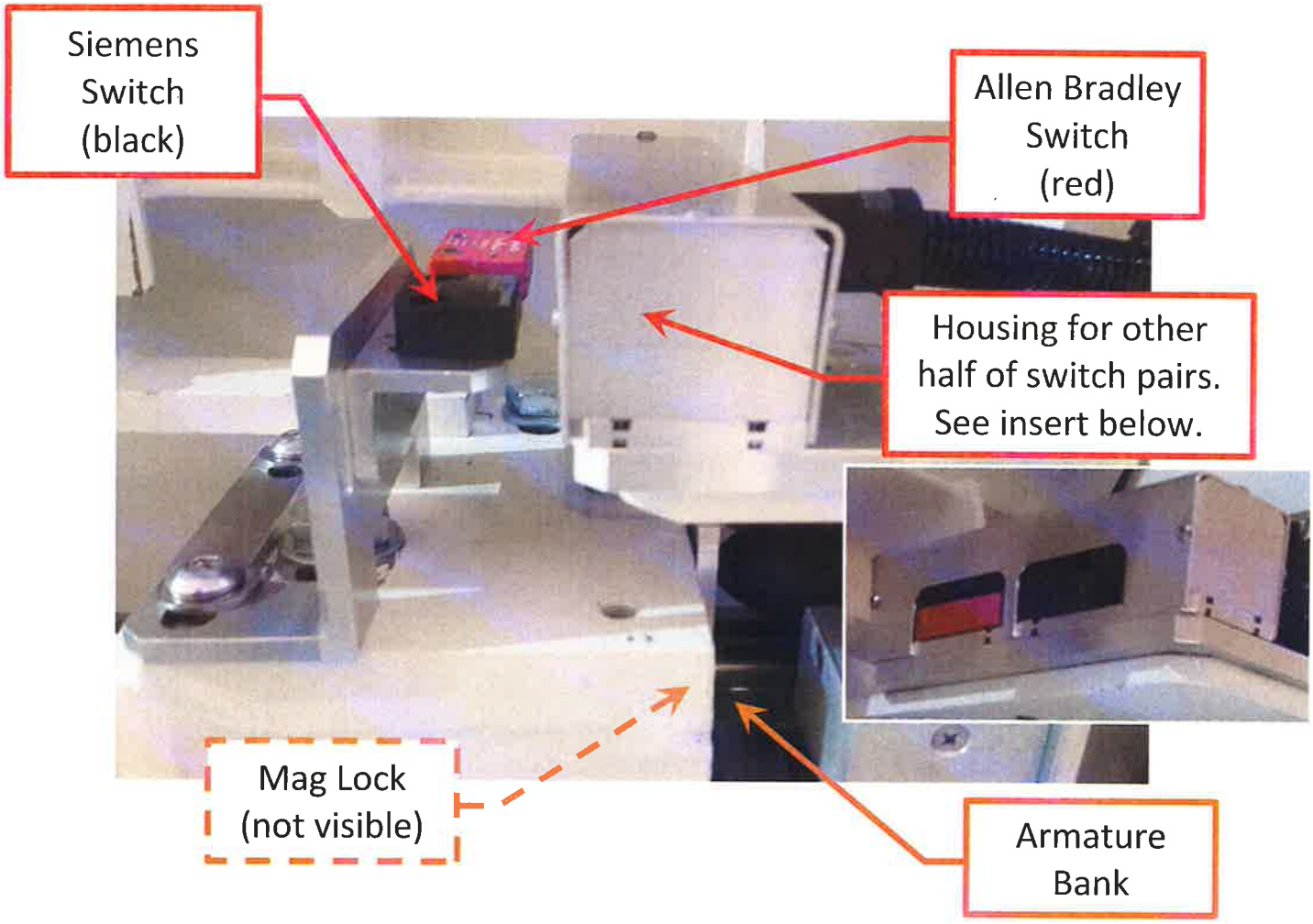

Figure 1b. PPS Lock Shown in Closed Position (Close up of top portion)

(Left-hand door shown above, right-hand is similar, mirror image)

Op #

1) **Close door and ensure there is contact between mag lock and armature bank**

ID	Inspection Description	Pass / Fail	DR #	Name/Life #	Date
1	Contact between Mag Lock and Armature			Ed Weigand 15332	3-15-17

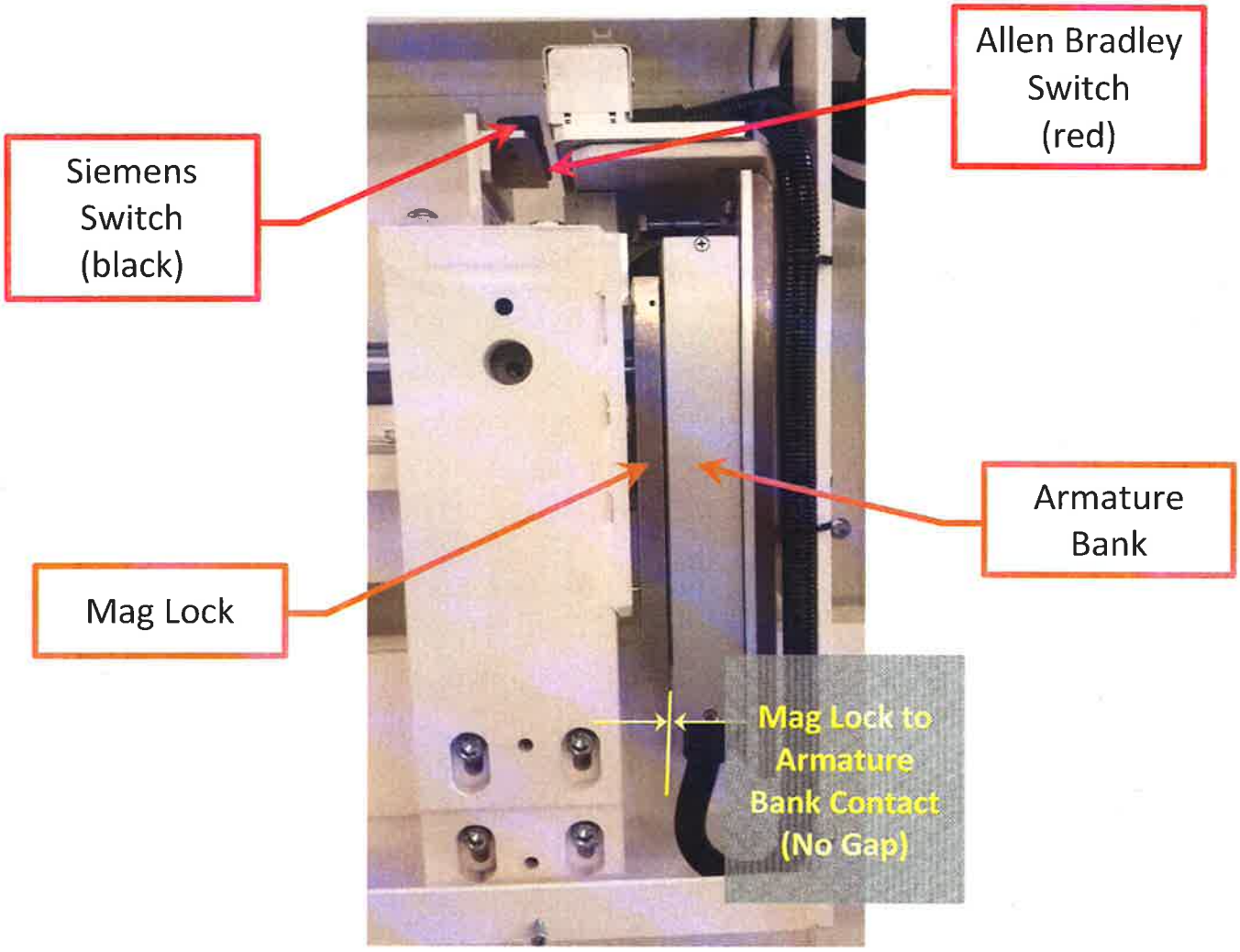

Figure 2. Operation #1: Mag Lock to Armature Gap

2) Use 1/4" precision spacer to set gap between Allen Bradley Switch Halves and Siemens Switch Halves

ID	Inspection Description	Nominal Gap	Gap Tolerance	Pass / Fail	DR #	Name/Life #	Date
2	Gap between Switch Halves	0.20 "	+0.0"/ - 0.003"			Ed Weigand 15372	3-15-17

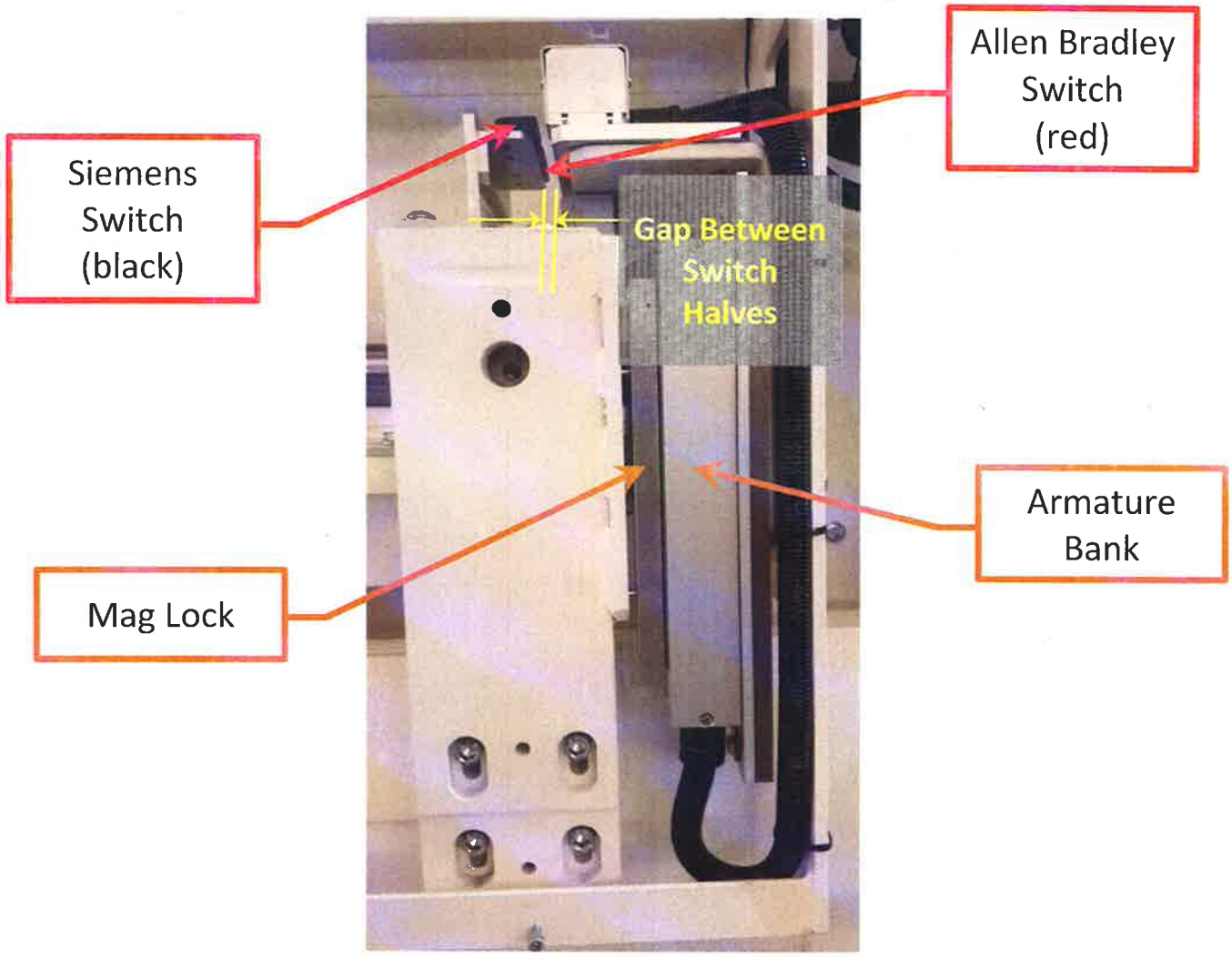

Figure 3. Operation #2: Gap Between Switch Halves

Submitted By: Ed Weigand *Print Name* — Ed Weigand 3-15-17 *Signature / Date*

Approvals (ready for certification)

Cognizant Engineer: Christopher Eng *Approved By (Print Name)* — Christopher Eng 3-17-17 *Signature / Date*

Inspection/Test Record

BROOKHAVEN NATIONAL LABORATORY

Photon Sciences Directorate
National Synchrotron Light Source II

Document Title: **Hutch Labyrinth Door PPS Switch Mechanical Inspection**

Beamline: 6 B M B

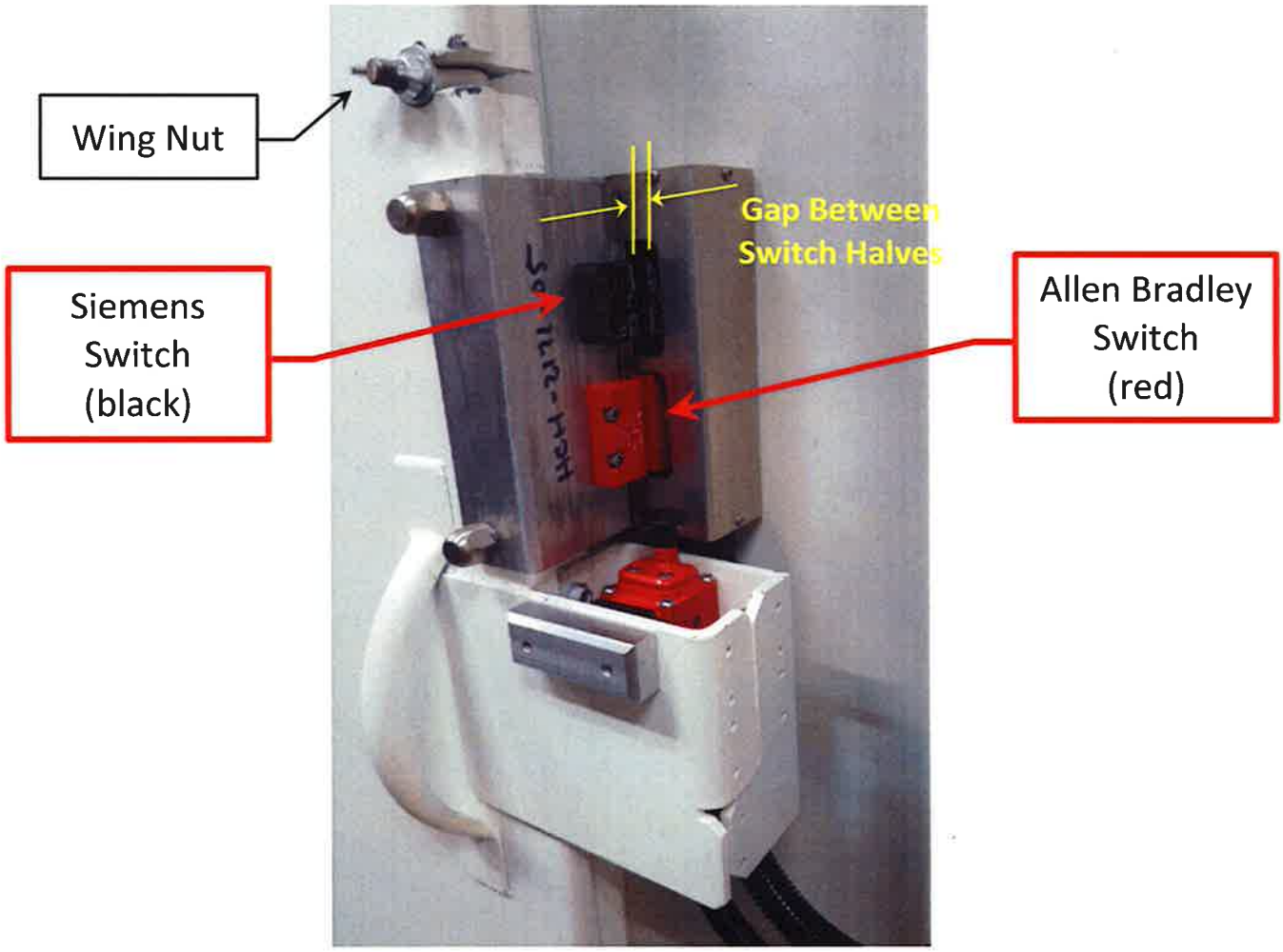

Figure 1. Hutch Wall Labyrinth Door PPS Lock (shown in closed position)

Op #

1) **Close labyrinth door and secure with wing nuts.**

2) **Use 0.20" precision spacer to set gap between Allen Bradley Switch Halves and Siemens Switch Halves**

ID	Inspection Description	Nominal Gap	Gap Tolerance	Pass / Fail	DR #	Name/Life #	Date
2	Gap between Switch Halves	0.20 "	+0.0"/ - 0.003"	✓		Ed Weigand 15372	3-15-17

Submitted By: Ed WeigAND — *Print Name*; Ed Weigand 3-15-17 — *Signature / Date*

Approvals (ready for certification)

Cognizant Engineer: Christopher Ery — *Approved By (Print Name)*; Christopher Ery 3-17-17 — *Signature / Date*