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C-A OPERATIONS PROCEDURES MANUAL

8.34.2 Procedure of the Building 1005E RHIC Yellow Ring Injection Kicker AC Circuit Breaker LOTO and High Voltage Caged Area Access

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Hand Processed Changes

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Collider-Accelerator Department Chairman Date

W. Zhang

8.34.2 Procedure of the Building 1005E RHIC Yellow Ring Injection Kicker AC Circuit Breaker LOTO and High Voltage Caged Area Access

1. Purpose

- 1.1 The purpose of this procedure is to instruct Pulsed Power Group technicians and CAS technicians how to perform Lockout Tagout (LOTO) of disconnect switches (external to the caged areas) for the RHIC Injection Kicker Power Supplies and locking and unlocking cage access gates to the RHIC Injection Kicker caged areas in Building 1005E for maintenance and troubleshooting.

2. Responsibilities

- 2.1 Pulsed Power Group Technicians and CAS technicians are responsible for their own safety and the execution of this procedure.
- 2.2 Pulsed Power Group Technical Supervisor and CAS Technical Supervisors are responsible for work planning and verify personnel performing this task are wearing proper Personnel Protection Equipment in compliance with latest version of applicable safety regulations, standards, policies, and procedures.

3. Prerequisites

- 3.1 All personnel involved in working on any electrical system or equipment in the C-A shall be familiar with SBMS Subject Area [Electrical Standards, C-A OPM 1.5.3 “Procedure to Open or Close Breakers and Switches and Connecting / Disconnecting Plugs”](#), BNL SBMS [Worker Safety and Health](#) Subject Area: [Lockout/Tagout \(LOTO\)](#), Subject Area: [Electrical Safety “Engineered Voltage Monitoring Solutions for Lockout/Tagout”](#). C-A will provide on-site/work specific training to individuals in the electrical safety aspects of their job functions and assignments.
- 3.2 The target groups for this procedure are the Pulsed Power Group and Collider-Accelerator Operation Support Group.
- 3.3 Wear PPE in compliance with latest version of applicable safety regulations, standards, policies, and procedures.
- 3.4 Additional training requirements are a “walk-through inspection” of the disconnect switch and cage gate locations for all the Pulsed Power Group System Engineers and Technicians, and C-A Operation Support Technicians.
- 3.5 Personnel performing this procedure shall be trained as a “Responsible Employee” as defined in BNL SBMS [Worker Safety and Health](#) Subject Area: [Lockout/Tagout \(LOTO\)](#).
- 3.6 Two trained persons are required to conduct the procedure.

4. Precautions

- 4.1 All personnel shall ensure their own safety by following the standards, safety regulations, and the training they receive. In general, all energy sources must be locked out and tagged. Working on or near energized sources is not permitted unless a valid working hot permit has been issued. Personnel shall utilize tools, instruments, equipment (e.g. proper connectors and proper ac line cords), etc., that are safe and proper for the job. If any part of a job appears unsafe to any individual, it is their duty to discontinue work and inform the supervisor, manager, ESH Coordinator, or the ESHQ Division Head, of the unsafe condition.
- 4.2 The procedure may be executed as an independent procedure or as part of the shutdown LOTO process in [C-A-OPM 2.6.4.](#)

5. Procedure

- 5.1 If found any abnormal or unsafe situation, stop work, leave the area, warn affected people, and notify supervisor, MCR, and C-A management immediately. In case of emergency, follow C-A and BNL emergency procedures.
- 5.2 All works must be planned.
- 5.3 Before the caged area can be entered when the kicker power supply is energized, the following steps must be followed:
 - 5.3.1 Bring System to “Local” and “OFF” state
 - 5.3.1.1 Allen-Bradley PLC PanelView terminal is installed in the system control rack, rack number ATR5C-5 in building 1005E.
 - 5.3.1.2 Local control mode: If the system is in “Remote” control mode, change it to ‘Local’ control mode by pressing “F1” in “RHIC Yellow Injection Kicker Status – Building 1005” main page and observe the display change to “Local”.
 - 5.3.1.3 Stand-By: If the system is in “ON” state under “Local” mode, press “F3” in “RHIC Yellow Injection Kicker Status – Building 1005” main page to send system to “Stand-By” state. Verify the display change to “Stand-By”.
 - 5.3.1.4 OFF: Under “Local” control mode, press “F2” in “RHIC Yellow Injection Kicker Status – Building 1005” main page to send system to “OFF” state. Verify the display change to “OFF”.

5.3.2 LOTO

5.3.2.1 Verify all personnel performing LOTO are wearing PPE as listed on the panel arc flash label or in [C-A-OPM 1.5.3](#).

5.3.2.2 Visually inspect AC disconnect switches and switch panels for safety and integrity.

5.3.2.3 To LOTO high voltage charging power supply disconnect switch only:

5.3.2.3.1 At the disconnect switch panel located on the outside of the cage, move the disconnect switch labeled “HV Power Supply” to “OFF” position. The switch is also labeled as 1L on P5E1K power panel in Building 1005E.

5.3.2.3.2 Verify that on the high voltage charging power supply ALE 802L front panel all indication lights are off and meters are off. The high voltage charging power supply is located in rack ATR5D-3 inside cage of Building 1005E.

5.3.2.3.3 Verify that all voltage indicators of UPA-100 in rack ATR5D-3 are off.

5.3.2.3.4 Apply Lock and Red Hold tag to the “HV Power Supply” disconnect switch 1L on P5E1K power panel in Building 1005E.

5.3.2.4 To LOTO entire system:

5.3.2.4.1 At the disconnect switch panel located on the outside of the cage in Building 1005E, move the main disconnected switch P5E1K labeled as “MAIN INJECTION KICKER MAIN POWER DISCONNECT SWITCH” to “OFF” position.

5.3.2.4.2 Verify that on the high voltage charging power supply ALE 802L front panel all indication lights are off and meters are off. The high voltage charging power supply is located in rack ATR5D-3 inside cage of Building 1005E.

5.3.2.4.3 Verify that all voltage indicators of UPA-100 in rack ATR5D-3 are off.

5.3.2.4.4 Verify that inside caged area all indicators and voltage or current meters are off.

5.3.2.4.5 Apply Lock and Red Hold tag to the main disconnect switch P5E1K labeled as “MAIN INJECTION KICKER MAIN POWER DISCONNECT SWITCH”.

- 5.3.2.4.6 Verify the system has been brought to zero-energy state by following methods given in “Engineered Voltage Monitoring Solutions for Lockout/Tagout”.

5.3.2.5 Cage entry:

- 5.3.2.5.1 The double at the left side of the cage entry cage door can now be unlocked.
- 5.3.2.5.2 Contact each Blumlein line outer pipe with Grounding stick. Leave the grounding stick on one of the Blumlein Pulse-forming-line outer pipes.
- 5.3.2.5.3 Connect Grounding device to the Blumlein outer pipe.
- 5.3.2.5.4 Verify all panels and control rack doors are properly closed with no exposed voltages.
- 5.3.2.5.5 The double doors in front of control racks may be unlocked if necessary.

5.3.2.6 System Start-Up

- 5.3.2.6.1 The double door in front of control racks shall be closed and locked.
- 5.3.2.6.2 Secure all panels and rack doors and verify no exposed voltage terminals inside caged area besides floating deck.
- 5.3.2.6.3 Remove Grounding device and grounding stick from Blumlein outer pipe.
- 5.3.2.6.4 Lock the double at the left side of the cage entry door to caged area.

5.3.2.7 Removing LOTO

- 5.3.2.7.1 Verify all personnel performing LOTO or removing LOTO are wearing PPE as listed on the panel arc flash label or in [C-A-OPM 1.5.3](#).
- 5.3.2.7.2 Visually inspect AC disconnect switches and switch panels for safety and integrity.
- 5.3.2.7.3 Remove Red Hold Tag and lock from the “HV Power Supply” disconnect switch and/or Main disconnect switch. Move disconnect switch(es) to “ON” position.
- 5.3.2.7.4 Verify all disconnect switches are at “ON” position.

5.3.2.8 Remote Ready

- 5.3.2.8.1 At PanelView terminal located in rack number ATR5C-5 in building 1005E
- 5.3.2.8.2 Set control to “Local” mode.

- 5.3.2.8.3 Send “Stand-By” command by pressing “F3” in PanelView terminal.
- 5.3.2.8.4 Send another “Stand-By” by pressing “F3” to clear any fault after three minutes in “Stand-by”.
- 5.3.2.8.5 When system is “ready” and out of “in-process”, send “ON” command by pressing “F4”.
- 5.3.2.8.6 Verify the system is working properly.
- 5.3.2.8.7 Send system to “Stand-by” state by pressing “F3”.
- 5.3.2.8.8 Send system to “Remote” control mode by pressing “F1”, and verify the display at top of PanelView is indicating “Remote”.

5.3.2.9 Cycle the switch on VME PLC located in Building 1005E rack 5B-4 crate CFE-5E-PS2 to ensure system control and status data communication with MCR.

5.3.2.10 Cycle the power switch at the back of digital scope in rack ATR5C-5 to ensure remote data communication of output waveforms with MCR.

5.3.2.11 Notify MCR the system is returned to their control.

6. **Documentation**

- 6.1 Fill out Pulse Power Group Red Tag Logbook
- 6.2 Record all system changes, modifications, maintenance activities, waveforms, etc.

7. **References**

- 7.1 [C-A OPM 1.5.3, “Procedure to Open or Close Breakers and Switches and Connecting / Disconnecting Plugs”.](#)
- 7.2 BNLSBMS [Worker Safety and Health](#) Subject Area: [Lockout/Tagout \(LOTO\)](#)

8. **Attachments**

None