

ACCELERATOR DIVISION ES&H PROCEDURE

ADSP-05-1220

Delivery Ring
13.8 kVAC and 480 VAC LOCKOUT/TAGOUT PROCEDURE

RESPONSIBLE DEPARTMENT Operations

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REVIEW AND CONCURRENCE RECORD

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1.0 PURPOSE AND SCOPE

The purpose of this Accelerator Division Safety Procedure (ADSP) is to outline and detail the conduct of LOCKOUT/TAGOUT (LOTO) for Group Lockout of the Delivery Ring enclosure for general access.

2.0 PERFORMANCE OF MAINTENANCE ACTIVITIES

During maintenance/repair activities of the Delivery Ring devices in the enclosure, the 13.8 kV and 480 V circuit breakers need to be locked out. The positive control points for LOCKOUT/TAGOUT are at the AP10, AP30, & AP50 service buildings.

3.0 THE NECESSITY OF WRITTEN LOTO PROCEDURE

The need for a written LOTO procedure is due to the necessity to lock out an energy source in an area in which access is restricted to authorized personnel only.

These panels then power each supply through individual breakers.

The Delivery Ring devices are powered from the panels serviced by disconnects:

- **DS-PHP-AP-10-4** at the AP10 service building
- **DS-PHP-AP-30-2, DS-PHP-AP-30-4 & DS-PHP-AP-30-PS** at the AP30 service building.
- **DS-PHP-AP-50-7 & DS-Y-AP50-1** (Outside transformer) at the AP50 service building.

4.0 RESPONSIBILITIES

4.1 OPERATIONS DEPARTMENT HEAD

The Operations Department Head shall develop and maintain a list of Lead Authorized Personnel and coordinate their training.

In addition, the Operations Department Head will ensure that the Lead Authorized Personnel implementing this procedure utilize appropriate lockout forms which are developed and maintained by the Operations Department, Electrical Engineering Support Department, Muon Department, and approved by the ES&H AD Division Safety Officer prior to use.

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4.2 LEAD AUTHORIZED PERSONNEL

The role of the Lead Authorized Person is to properly Lockout/Tagout the disconnect switches which de-energize the 13.8-kV and 480-volt circuit power. The completion of the Lockout/Tagout is to be documented using a lockout form developed and maintained by the Operations Department, Electrical Engineering Support Department, Muon Department, and approved by the ES&H AD Division Safety Officer.

The Lead Authorized Person shall carry the approved lockout form and each applicable step shall be checked off as they are performed. A copy of the completed form shall be placed in the Main Control Room (MCR) Electronic Log (e-log). Completed original forms shall be maintained for one calendar year.

The Lead Authorized Personnel shall be from the Accelerator Operations Department who are authorized in writing by the Operations Department Head.

Authorized employees, who have the necessary knowledge and current Lockout/Tagout training required by FESHM chapter 2100 shall conduct lockout of the Delivery Rings & Extraction Enclosure including Extraction Stub Group Lock Box.

5.0 THE STEPS OF LOCKOUT/TAGOUT PRIOR TO MAINTENANCE ACTIVITY

Upon desiring to perform LOTO on the Delivery Ring devices, the MCR Crew Chief shall designate a Lead Authorized Person from a list of such named personnel maintained by the Operations Department Head.

5.1 **Prepare:** The Lead Authorized Person shall review this written procedure if necessary and obtain a copy of the approved lockout form. (Copies will be kept in a lockout binder on the Duty Assistant's desk.)

5.2 **Notify:** Notification shall be given to personnel deemed appropriate by the MCR Crew Chief.

5.3 **Shut Down:** The Lead Authorized Person shall check that the Delivery Ring devices are off. (DS-PHP-AP-30-4 & DS-PHP-AP-PS feeds a part of the power supplies in the Extraction Enclosure as well as in the Delivery Ring).

At the AP10 Service Building lock out the disconnect switch for the power supplies by performing the following:

- A. Open disconnect switch **DS-PHP-AP-10-4**
 - a. Operation of the disconnect switch in this step requires NFPA 70E Class 0 activity.

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- B. Turn and remove the Kirk Key from the actuator thus locking the disconnect in the open position.
- C. **Verify:** The Lead Authorized Person shall verify that all three switches are open, though the windows. The Lead Authorized Person shall indicate on the approved lockout form the accomplishment of this step.

At the AP30 Service Building lock out the disconnect switch for the power supplies by performing the following:

- A. Open disconnect switches
 - a. **DS-PHP-AP-30-2**
 - b. **DS-PHP-AP-30-4**
 - c. **DS-PHP-AP-30-PS**
 - i. Operation of the disconnect switches in this step requires NFPA 70E Class 0 activity.
- B. Turn and remove the Kirk Keys from the actuators thus locking the disconnects in the open position.
- C. **Verify:** The Lead Authorized Person shall verify that all three switches are open, though the windows. The Lead Authorized Person shall indicate on the approved lockout form the accomplishment of this step.

At the AP50 Service Building lock out the disconnect switch for the power supplies by performing the following:

- A. Open disconnect switch **DS-PHP-AP-50-7**
 - a. Operation of the disconnect switch in this step requires NFPA 70E Class 0 activity.
- B. Turn and remove the Kirk Key from the actuator thus locking the disconnect in the open position.
- C. **Verify:** The Lead Authorized Person shall verify that all three switches are open, though the windows. The Lead Authorized Person shall indicate on the approved lockout form the accomplishment of this step.

Outside at the AP50 Service Building lock out the transformer for the power supplies by performing the following:

- D. Open disconnect switch **DS-Y-AP50-1**
 - a. **Operation of the disconnect switch in this requires NFPA 70E Class 2 activity.**

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E. Turn and remove the Kirk Key from the actuator thus locking the disconnect in the open position.

F. **Verify:** The Lead Authorized Person shall verify that all three switches are open, through the window. A flashlight may be needed in determining the knife switch positions. The Lead Authorized Person shall indicate on the approved lockout form the accomplishment of this step

5.4 **Lock and Tag Out:** The Lead Authorized Person shall return to the Main Control Room. Proceed to the **Muon Campus Kirk Key Lockout Board**. The **DS-PHP-AP-30-4 & DS-PHP-AP-30-PS** kirk keys shall be inserted into the appropriate key slots in the AP30 key block. Turn the keys and remove the **Delivery Ring DS-PHP-AP-30-4 & DS-PHP-AP-30-PS Captured Key** and place this kirk key into the appropriate slot in the Delivery Ring block. The **D:IB DS-Y-AP50-1, DS-PHP-AP-10-4, DS-PHP-AP-30-2, & DS-PHP-AP-50-7** kirk keys shall be inserted into the appropriate slots in the Delivery Ring block and turned releasing the Delivery Ring LOTO key. The Delivery Ring LOTO key shall be placed in the Delivery Ring group LOTO lockbox.

The Lead Authorized Person shall attach a **BT-5** padlock (MCR Crew Chief lock) to the Delivery Rings lockout box. A copy of the completed lockout form shall be entered into the MCR e-log.

6.0 **SPECIAL REQUIREMENTS FOR SHIFT/PERSONNEL CHANGE**

If the accelerator enclosure activities continue beyond a shift, the next MCR Crew Chief assumes the responsibility and authority of the off-going MCR Crew Chief for this group lockout.

7.0 **THE STEPS FOR RETURN TO SERVICE**

The MCR Crew Chief or Lead Authorized Person must coordinate the following steps prior to returning the equipment to service after service or maintenance activity

7.1 **Check Equipment:** Check the MCR lockbox and ensure that all personnel have removed their locks and tags.

7.2 **Check Work Area:** Check that the Delivery Ring enclosures are secure and all keys have been returned.

7.3 **Notify:** The MCR Crew Chief or Lead Authorized Person shall notify appropriate personnel that they are ready to reenergize.

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7.4

Remove Padlocks and Tags and Reenergize: The MCR Crew Chief or Lead Authorized Person shall remove the Crew Chief locks and tags from the Delivery Ring lockbox. The Lead Authorized Person shall obtain the Delivery Ring LOTO captured key and return it to the proper slot in the Muon Campus Kirk Key Lockout Board Delivery Ring block. Turn the key releasing the other keys. Remove the **D:IB DS-Y-AP50-1, DS-PHP-AP-10-4, DS-PHP-AP-30-2, & DS-PHP-AP-50-7** kirk keys to take to the field. Remove the **Delivery Ring DS-PHP-AP-30-4 & DS-PHP-AP-30-PS Captured Key** and place into the proper slot in the AP30 block and turn releasing the other keys. Remove the **DS-PHP-AP-30-4 & DS-PHP-AP-30-PS** kirk keys and these keys will be used in the field.

At the AP10 Service Building enable the disconnect switch for the power supplies by performing the following:

- A. Insert the Kirk Key for **DS-PHP-AP-10-4** and turn it to allow the operation of the disconnect.
- B. Close disconnect switch **DS-PHP-AP-10-4**
 - a. Operation of the disconnect switch in this step requires NFPA 70E Class 0 activity.
- C. **Verify:** The Lead Authorized Person shall verify that all three switches are closed, though the windows.

At the AP30 Service Building enable the disconnect switch for the power supplies by performing the following:

- A. Insert the Kirk Keys and turn them to allow the operation of the following disconnects:
 - a. **DS-PHP-AP-30-2**
 - b. **DS-PHP-AP-30-4**
 - c. **DS-PHP-AP-30-PS**
- B. Close disconnect switches for
 - a. **DS-PHP-AP-30-2**
 - b. **DS-PHP-AP-30-4**
 - c. **DS-PHP-AP-30-PS**
 - i. Operation of the disconnect switches in this step requires NFPA 70E Class 0 activity.
- C. **Verify:** The Lead Authorized Person shall verify that all three switches are closed for all contactors, though the windows.

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At the AP50 Service Building enable the disconnect switch for the power supplies by performing the following:

- A. Insert the Kirk Key for **DS-PHP-AP-50-7** and turn it to allow the operation of the disconnect.
- B. Close disconnect switch **DS-PHP-AP-50-7**
 - a. Operation of the disconnect switch in this step requires NFPA 70E Class 0 activity.
- C. **Verify:** The Lead Authorized Person shall verify that all three switches are closed, though the windows.

Outside at the AP50 Service Building enable the disconnect switch for D:IB by performing the following:

- A. Insert the Kirk Key for **DS-Y-AP50-1** and turn it to allow the operation of the disconnect.
- B. Close disconnect switch **DS- Y-AP50-1**
 - a. Operation of the disconnect switch in this step requires NFPA 70E Class 2 activity.
- C. **Verify:** The Lead Authorized Person shall verify that all three switches are closed, though the windows.

This completes the requirements for returning the equipment to service.

8.0 **PROCEDURE TRAINING REQUIREMENTS**

Initial training shall be coordinated by the Operations Department Head. The time interval for re-qualification will be every year in accordance with Laboratory procedures.

8.1 All personnel performing this procedure are required to be trained in Lockout/Tagout Level 2 (FN000212 / CR).

8.2 All personnel performing this procedure are required to be trained in Electrical Safety in the Workplace (NFPA 70E) (FN000385 / CR).

9.0 **DISTRIBUTION**

An electronic controlled copy of this procedure is maintained on the AD ESH website at: https://ad.fnal.gov/hq/AD_AP.html.

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APPENDIX A: ACCELERATOR DIVISION SAFETY PROCEDURE WRITTEN LOTO
DEVELOPMENT AND REVIEW RESPONSIBILITIES

This appendix describes the responsibilities for drafting and reviewing written procedures used for exposed bus Lock Out/Tag Out (LOTO) with the purpose of accessing accelerator and beamline enclosures.

These procedures are formalized as Accelerator Division Safety Procedures (ADSP) to establish ESH&Q policies for implementation by AD departments¹, in this case as a written LOTO procedure, to control access to AD facilities as needed to protect the health and safety of personnel².

The scale of the systems included in the procedures involve multiple organizational units having only partial knowledge of or responsibility for the overall system. The written LOTO procedure shall be drafted³ and reviewed⁴ by knowledgeable employees from each D/S/P that owns, uses, maintains, or services equipment directly affected by or used to execute the written LOTO procedure, including Energy Isolating Devices and approved by a line manager at the department head level or higher (or designee).

The AD OPS department provides the authorized and lead authorized employees, performs the inspector component of the training and maintains the training of the lead authorized personnel.

The AD EES department acts as the knowledgeable employee for magnet power supplies from the AC service LOTO Energy Isolation Device, through the power supply and to the power supply terminals. In some instances, FESS maintains the LOTO Energy Isolating Device and is the knowledgeable employee for that device.

The department(s) responsible for the enclosure act as the knowledgeable employee for the loads in the beamline enclosure.

The approval of the line manager is recorded in the REVIEW AND CONCURRENCE RECORD of the ADSP indicating that they have reviewed the procedure, provided input for their area of knowledge and recognize their responsibilities as users, owner, maintainers or servicers of a portion of the systems used in the written LOTO procedure.

APPROVAL: _____



Mike Lindgren
Accelerator Division Head

DATE 12/18/2019

¹ ADAP-01-0001 3.1.2c
² ADAP-01-0001 3.1.2d
³ FESHM 2100 5.7
⁴ FESHM 2100 4.4

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