Title:	DEFLECTOR BLOCKS MOVING PROCEDURE		
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1.0 PURPOSE

The intent of this procedure is to ensure that the Cyclotron deflector blocks, when moved, are moved safely and that no radioactive contamination is released during the moving process.

This procedure must be used whenever it is necessary to move the concrete shielding blocks out of, or into, the deflector niche space in the east wall of the 88-inch Cyclotron radiation shielding.

2.0 QUALIFICATION

This procedure is to be performed only by a qualified Cyclotron staff member, who has been trained in this procedure, typically one of the engineering staff, or maintenance machinist, or a mechanical or electronic technician.

This procedure may be performed by the persons who have completed NSD1023 "Deflector Block Moving Procedure" training. The EH&S Training Reports database may be checked to find the names of the persons that have completed the required training for this procedure.

Use of the crane must be done by a person with LBNL crane training, and who is specifically trained on the B88 30-ton crane. Crane training is not an essential requirement of this procedure, only of the person actually operating the crane to lift the deflector niche concrete shielding blocks.

3.0 HAZARD REVIEW

The performance of this procedure may subject personnel to the following potential hazards:

Radioactive Contamination:

Hazard: There may be some radioactive surface contamination present on the floor of the deflector niche, or on the deflector tray rails, or on the concrete shielding blocks, or on the stairway in the east alley, or on the block platforms in the east alley.

Mitigation: The Radiation Control Technician (RCT), or an EH&S radiation safety monitor, must survey and decontaminate these surfaces to ensure there is no removable contamination. The LBL ALARA (As-Low-As Reasonably-Achievable) Policy for personal

radiation exposure applies the performance of this procedure.

Crush Hazard:

Hazard: The shielding blocks are massive and pose a potential crush hazard.

Mitigation: Use of the crane must be done by a person with LBNL crane training, and is specifically trained on the B88 30-ton crane. Use of the block moving air-sled is done only by trained personnel. All unnecessary personnel are kept away. Whenever moving a block on an air suspension, make all movements slowly. Never move a block unless all hands and feet are clear. If the block is extracted quickly, it may overshoot the edge of the platform, lose air support, and settle in a position that will require a crane to reposition it over the platform.

Falling Hazard:

Hazard: The east alley stairway to the mezzanine must be removed. There is potential for falling when the stairway has been removed.

Mitigation: Advise the Heavy Elements group leader that the mezzanine will have no stairway for access, and that any unnecessary equipment should be shut down beforehand. Rope off the stairway to prevent access to the east alley mezzanine.

4.0 PROCEDURE

4.1 Preparation:

Before moving any deflector block, or even the East alley stairs, a radiation survey must be done to ensure there is no radioactive contamination around that may be spread by moving shielding blocks. Survey before work begins, during the work as each block or stairway is moved, and after the work, to be certain that any contamination is discovered before it can be spread.

Before moving any deflector block, or even the East alley stairs, the staff members who will be doing the work shall meet in the East alley and review the work site, review the hazards, review the mitigation of the hazards and review the procedure.

4.2 Moving the Blocks:

To execute this procedure, proceed as follows:

4.2.1. Have the RCT complete a radiation survey for any radioactive contamination that may be spread by moving shielding blocks, the stairs, or the platform flooring. Survey the area before work begins, during the work as each block or stairway is moved, and after the work, to be certain that any contamination is discovered and contained before it can be spread.

4.2.2. Advise the Heavy Elements group leader that the mezzanine will have no stairway for access, and that any unnecessary equipment should be shut down.

4.2.3. Using rope, tie the swing gate at the head of the stairway to the mezzanine in the closed position.

4.2.4. Clean the aluminum stairs and the blue wooden stairs.

4.2.5. Have a properly-trained crane operator move both stairs out to the High Bay floor.

4.2.6. Clean and lift the plywood “flooring” off the stairway landing. Clean and remove the aluminum bridge. Resurvey for contamination.

4.2.7. Disconnect the MS electrical connector from each of the two outer shielding blocks.

4.2.8. Clear out everything from below the stairway landing.

4.2.9. Connect the airline (red hose, connected to an air valve at Column G-1). Open the handwheel valve feeding the airline. Pointing the hose end away from people, squeeze the level valve to blow any dirt from the air line.

4.2.10. Connect the airline to the RL fitting at the base of the one of the two outer concrete blocks.

4.2.11. Squeeze the lever valve on the block-end of the airline to raise the block. It will rise only about 1/32 of an inch. Slowly move the block out over the platform and position it squarely over the platform, then release the lever valve and allow the block to settle.

4.2.12. Shift the air hose, and move the second block out to its platform.

4.2.13. Disconnect the air hose.

4.2.14. Have a trained crane operator move both blocks to the High Bay floor outside the East Alley area. Use wood to support the blocks on the High Bay floor.

4.2.15. Connect the air hose to the inner concrete block that appears to be least obstructed (easiest to extract).

4.2.16. Draw out that block and position it over the platform, but with its west end just inside the main concrete shielding. It will remain in this position to provide shielding from radiation emitted by the deflector tray toward the east alley.

4.2.17. Draw out the second inner shielding block and position it over its platform. Again, place its west end just inside the main concrete shielding to provide shielding from radiation emitted by the deflector tray toward the east alley.

4.2.18. Close the hand wheel air valve at Column G-1. Disconnect the air hose from the blocks.

4.2.19. Secure the Crane.

4.2.20. When returning the blocks to their normal position, as Cyclotron shielding, first complete a radiation swipe survey of the "floor" of the shielding block niche and surrounding areas, for any evidence of removable contamination. Never move a block unless all hands and feet are clear. Always move blocks slowly to prevent overshooting the desired position for block placement. Last, valve off the air supply and disconnect the air hose as soon as the block is in position.

4.2.21. When returning the blocks to their stored positions in the niche reverse the sequence of block moving steps.

4.2.22. Reposition the aluminum bridge, the plywood flooring and the stairs.

4.2.23. Reconnect the MS electrical connector to each of the two outer shielding blocks.

5.0 RECORDS

Records generated by compliance with this procedure are to be in compliance with RPM, Section 1.18, Records Management. Records generated through implementation of this procedure consist of the entry in the Vault Logbook indicating the blocks were moved for deflector work. The Vault Logbook is maintained outside the west vault door by the Operations Supervisor.

6.0 REVIEW OF PROCEDURE

Under the guidelines for DOE Order 420.2B, this procedure will be reviewed at least once every three years, or sooner if changes occur that may impact the appropriateness or implementation of this procedure.

REVISION HISTORY

8 July 1996: New procedure written to establish formal process.

20 November 2003: Updated as V1.2 to add definitions, and update the procedure.

1 June 2006: 88-PRO-023 was updated and approved as V 3.0 to reflect current operating practices and implementation.

7.0 GLOSSARY

AIR SLED: Each block is fitted with a hovercraft-like plenum and air dam, and an air inlet. These act as an air sled to easily lift and move the blocks.

ALARA Policy: The LBL ALARA (As-Low-As Reasonably-Achievable) Policy for personal radiation exposure. For the Laboratory ALARA policy see LBL Publication 3000 Section 21.3: ALARA Program at Berkeley Lab.

DEFLECTOR TRAY: The entire deflector assembly, including the tray, on which the deflectors are mounted, and the truck and wheels on which the tray is mounted. This assembly can be rolled back into the deflector niche for safe storage if the tray components are activated and emitting gamma, X, and beta rays.

MS CONNECTOR: A round, circular military standard (MIL-STD) electrical connector.

DEFLECTOR NICHE: a volume inside the east concrete shielding blocks of the 88-inch Cyclotron radiation shielding.

OSHA: Occupational Safety and Heath Act, the United States (federal) and California safety guidelines for on the job safety.

8.0 REFERENCES

1. LBNL Publication 3000, **Health and Safety Manual**

2. DOE Order: DOE O 420.2B, *Safety of Accelerator Facilities*

9.0 ATTACHMENT

Attachment A. Deflector Blocks Moving Checklist. Changes to the checklist do not warrant a revision of the procedure.

Attachment A
DEFLECTOR BLOCKS MOVING PROCEDURE Checklist

Preparation

[ ] 1. Have the RCT complete a radiation survey.
[ ] 2. Advise the Heavy Elements group leader about impact of block moving.
[ ] 3. Using rope, tie the mezzanine swing gate closed.
[ ] 4. Remove stairs, flooring, and aluminum bridge. Resurvey for contamination.
[ ] 5. Disconnect the MS electrical connector from the shielding blocks.
[ ] 6. Clear out everything from below the stairway landing.

Move the Blocks

[ ] 7. Connect hose to the air supply. Flush hose with air.
[ ] 8. Connect the airline to one of the two outer concrete blocks.
[ ] 9. Squeeze the lever valve to raise the block. Slowly move the block out over the platform and position it squarely over the platform, then release the lever valve and allow the block to settle.
[ ] 10. Shift the air hose, and move the second block out to its platform.
[ ] 11. Disconnect the air hose.
[ ] 12. Have a trained crane operator move both blocks to the High Bay floor outside the East Alley area. Use wood to support the blocks on the floor.
[ ] 13. Connect the air hose to the inner concrete block that appears to be least obstructed (easiest to extract).
[ ] 14. Raise the block and draw out that block and position it over the platform, but with its west end just inside the main concrete shielding. It will remain in this position to provide shielding from radiation emitted by the deflector tray toward the east alley.
[ ] 15. Draw out the second inner shielding block and position it over its platform. Again, place its west end just inside the main concrete shielding to provide shielding from radiation emitted by the deflector tray toward the east alley.
[ ] 16. Close the hand wheel air valve at Column G-1. Disconnect the air hose from the blocks.
[ ] 17. Secure the Crane.

Replace the Blocks

[ ] 1. When returning the blocks to their normal position, as Cyclotron shielding, first complete a radiation swipe survey of the "floor" of the shielding block niche and surrounding areas, for any evidence of removable contamination. Valve off the air supply and disconnect the air hose as soon as the block is in position.
[ ] 2. When returning the blocks to their stored positions in the niche reverse the sequence of block moving steps.
[ ] 3. Reposition the aluminum bridge, the plywood flooring and the stairs.
[ ] 4. Reconnect the MS electrical connector to each of the two outer shielding blocks.