If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match. The on-screen version of the Collider-Accelerator Department Procedure is the Official Version. Hard copies of all signed, official, C-A Operating Procedures are available by contacting the ESSHQ Procedures Coordinator, Bldg. 911A

C-A OPERATIONS PROCEDURES MANUAL

14.13.2 EMS Training for Beam Stops & Collimators

Text Pages 2 through 5

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approved: ***Signature on File*** _____
Collider-Accelerator Department Chairman Date

R. Karol

14.13.2 EMS Training for Beam Stops & Collimators

Environmental Training Package for Beamstops and Collimators (Beam Loss and Minimizing Disposal Cost)

This package has been designed to aid in the delivery of required job-specific training for the following activities that result from steering beams through accelerators and into experimental areas as identified in the environmental process evaluation

- Radionuclide generation in surrounding soils
- Radionuclide generation in air in tunnel with potential release to atmosphere or release of tritiated condensate through the air handling system
- Radionuclide generation in cooling water with potential release of dissolved radio-gas to air and potential release of tritiated water to the environment

Your position has been determined to have significant potential to impact the environment. Thus, C-A Department Management has prepared the questions & answers on the following pages for your specific work/processes.

This environmental material is incorporated into your current job and procedure training. If you have specific questions about this information after you have read the material, contact the C-A Department ESSHQ Division Head, Ray Karol (mailto:rck@bnl.gov).

You may keep this material as a handout and use it as a reference aid.

This specific training course is linked to your job-training assessment (JTA). You must read and acknowledge this material as part of the qualification to perform as a Main Control Room Operator, Operations Coordinator, Accelerator Physicist, Liaison Physicist or Liaison Engineer. Please fill out the Read and Acknowledgement form and return it promptly.

Read & Acknowledgement Form

Environmental Process Evaluation Title: Beamstops and Collimators (Beam Loss and Minimizing Disposal Cost)

Environmental Aspects: Soil activation, atmospheric discharges, power consumption, radioactive waste

Contacts for Further ESSHQ Information:
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Head of ESSHQ Division, R. Karol
Environmental Coordinator, J. Scott
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Training Manager, J. Maraviglia
Training Records, A. Luhrs
Work Control Manager, P. Cirnigliaro

Course Objective: Because your work activities have been identified as having significant potential to impact the environment, this course has been designed to provide you with the job-specific information that you must know to protect the environment.

1) What potential impacts to the environment are associated with your activities?

- Allowing the beam to be steered away from intentional loss points will cause:
  - Unintended soil activation and subsequent groundwater contamination
  - Unintended beam line component activation with subsequent staff exposure, shortened equipment lifetime, and increased radioactive waste
  - Unintended cooling water activation with subsequent release of dissolved radio gas to air and buildup of tritiated water inventory

- Short-lived air activation products are created within accelerators, AGS and NSRL target caves, and pre-injectors. Operation of RHIC results in the production of airborne radionuclides in all six sextants of the tunnel due to small beam losses. All such radionuclides could potentially be released though tunnel penetrations. The NSRL target room is ventilated while operating so these air activation products are normally released to the environment. Levels of air activation for NSRL target room have been evaluated and are at very low, acceptable levels.

2) What consequences may result if your operations were to impact the environment?

- Direct activation of soil could lead to groundwater contamination. This results in significant costs for plume characterization, engineering studies to determine the need for groundwater remediation and remediation (if needed).

- Unmonitored radioactive discharges to the atmosphere could incur penalties under the Clean Air Act.

3) What benefits or positive effects would you notice with improved environmental performance?

- Safer, cleaner workplace
- Clear roles and responsibilities
- Improved relationship with regulators and the public
- Control of disposal costs
- Control of activated materials
- Reduced emissions
- Absence of contaminated groundwater plumes

4) What role and responsibility do you have for these potential impacts and environmental performance?

- To ensure controls are in place
- To ensure controls keep working
- To take action when controls fail
- To create and keep appropriate records relative to operational controls
- To contact supervision if unsure of how to perform the work or if the procedures are unclear or incorrect

5) What controls or procedures are implemented to reduce the potential for emergency?

- Rainwater barriers (caps) protect activated soil from rainwater penetration that may lead to leaching and groundwater contamination. The following intended loss points are protected with rainwater barriers:
    - J-10 Beam Scraper
    - E-20 area
    - Booster dump
    - V beam stop
    - V target hall and upstream portion of the V line near VQ12 magnet
    - Beam stops, targets and collimators in Building 912
    - Linac to BLIP area at end of Linac
    - Transfer line between Booster and AGS
    - NASA Space Radiation Laboratory beam line and target room
    - U beam stop
    - W beam stop
    - Collider beam dumps and collimators (except 6 o'clock collimator, which has low soil activation as verified by periodic analysis of soil samples).

- Activation of air is minimized by ensuring that beam-travel through air is minimized. This is done by restricting beam travel to evacuated tubes or by using helium-filled bags or blanked-end pipe in areas where the beam must leave a vacuum beam pipe.
- Rainwater barrier inspections (periodic)
- ALARA Strategies for Tuning During Proton Operations, C-A-OPM 6.1.10
- Measurement of Losses During the Accelerator Cycle, C-A-OPM 6.1.10.a
- Monitored and alarmed cooling water systems

- Accelerator Safety Envelope Procedure (Linac, Booster, AGS), 2.5
- Accelerator Safety Envelope for Collider Operations Procedure, 2.5.2
- Accelerator Safety Envelope for NSRL, 2.5.3
- Beam Current Transformers and Beam Loss Monitors
- Groundwater Monitoring Wells
- Condensate from air handling systems is piped to the sanitary sewer
- Closed cooling systems to prevent release of dissolved radio-gas or tritiated water vapor
- Monitoring, Controlling and Minimizing Unnecessary Power Consumption by C-A Accelerators, 2.30 (Note: only MCR and CAS need to be familiar with this procedure)

6) How would you respond in an emergency to reduce the potential for environmental impact and what actions could be taken to mitigate the event?

- See C-A OPM 3.0, Local Emergency Plan for the C-A Department
- See C-A OPM Chapter 10, Occurrence Reporting
  - Call Spill Response Hotline – X2222 (if calling from a cell phone, dial (631) 344-2222)

7) What pollution prevention and waste minimization techniques have been or could be considered to reduce or eliminate the potential to affect the environment?

- If we install more concrete or iron shielding between the beam loss point and the soil, then we would build-up less radioactivity in the soil
- If we reduce the activation of components by better tuning and beam control, then we would build up less of an inventory of radioactive materials, radioactive waste and radioactive cooling water

Suggestions or comments about pollution prevention or waste minimization are welcome by C-A management.

8) Are there any key Environmental-specific Competency Requirements for this position?

- None.

Additional Environmental Information:

Click on the items below to learn more about C-A Beam Stops & Collimator Operations.

- Process Assessment for C-A Beam Stops & Collimator Operations
- Environmental Management Program
- Operational Control Form for C-A Beam Stops & Collimator Operations
- Record of Decision (ROD) for Area of Concern 16T g-2 Tritium Source Area and Groundwater Plume, Area of Concern 16K Brookhaven Linac Isotope Producer, and Area of Concern 12 - Former Underground Storage Tanks