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C-A OPERATIONS PROCEDURES MANUAL

9.5.16 Labeling, Documentation and Handling of Radioactive Materials

Text Pages 2 through 8

**Hand Processed Changes**

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

R. Karol

## 9.5.16 Labeling, Documentation and Handling of Radioactive Material

### 1. Purpose

- 1.1 This procedure provides instructions to C-AD and C-AD Facility Support (FS) for:
- Labeling;
  - Storage and;
  - Handling of radioactive material.
- 1.2 Approval to use radioactive material is given in the SBMS Subject Area, Work Planning and Control for Experiments and Operations.

**Note:**

Labeling, documentation and handling of sealed and unsealed radioactive sources is described in SBMS Subject Area “Sealed Radioactive Source Control”, and information on Procurement of Sources is found in HP-SOP-026.

### 1.3 Definitions

Activated Materials – Any item or material, which has been exposed to activating radiation (neutrons, protons, deuterons, etc.) and has radiation detectable above background levels.

Decay in Storage – Radioactive waste with a half-life less than 90 days that is allowed to decay for a minimum of 10 half-lives or until it is no longer detectable for the purpose of waste minimization and disposal.

Department / Division Source Custodian – An individual who is trained as a source custodian (RWT-600), has Rad Worker I training as a minimum, has been designated to maintain cognizance over accountability and control of their assigned sealed sources.

Exempt Radioactive Materials - Radioactive materials that are exempt from the requirements of this procedure. See Attachment 7.4 for a listing of the exemptions.

Master Source Custodian – BNL RCD individual responsible for developing / maintaining the Laboratory Source Database.

Naturally Occurring Radioactive Material (NORM) – Term usually applied when naturally-occurring radionuclide is present in sufficient quantities or concentrations to require control for purposes of radiological protection of the public or the environment. NORM does not include source, by-product, or

special nuclear material (terms defined by law and referring primarily to uranium, thorium and nuclear fuel cycle products); or commercial products containing small quantities of natural radioactive materials (e.g., phosphate fertilizer, potassium chloride for road de-icing) or natural radon in buildings.

Radioactive Material (RAM) – Any material, equipment or system component suspected of, or determined to be, contaminated. Radioactive material also includes activated material, sealed and unsealed sources, and materials that emit radiation.

RADIOACTIVE MATERIAL Area (RMA): - Any area, within a controlled area, accessible to individuals, in which items or containers of radioactive material exceeds either 10 percent (0.1) of the applicable values in the Sealed Source Accountability Table, Appendix A of Chapter 4 of the BNL Rad Con Manual (Reference 6.4) or 1 millicurie, whichever is less.

Long-Term RMA(s) – RMS(s) established for long-term storage of material used in departmental operations that is not designated as waste. Due to infrequent use the material remains in storage for extended periods of time (i.e., one year or more).

RMA Responsible Person (s)– Individual appointed by C-AD management to perform task associated with their designated long-term radioactive material storage area as stated in this procedure. These individuals are currently members of the ESSHQ Division.

Sealed Radioactive Source (Sealed Source): A Radioactive source manufactured, obtained, or retained for the purpose of utilizing the emitted radiation. The sealed radioactive source consists of a known or estimated quantity of radioactive material contained within a sealed capsule, sealed between layer(s) or non-radioactive material, or firmly fixed to a non-radioactive surface by electroplating or other means intended to prevent leakage or escape of the radioactive material. Sealed radioactive sources do not include reactor fuel elements, nuclear explosive devices, and radioisotope thermoelectric generators.

## **2. Responsibilities**

- 2.1 C-AD Facility Support (FS) Representative and Radiological Control Technicians (RCTs) are responsible to:
  - 2.1.1 Comply with this procedure and all applicable sections of the Rad Con Manual (Reference 6.4).
- 2.2 The Responsible Person for the long term Radioactive Material Area(s) (RMA)(s) shall:

- 2.2.1 Comply with this procedure and all applicable sections of the Rad Con Manual (Reference 6.4).
- 2.2.2 Perform the task in section 5.9 of this procedure for each of their assigned RMA(s).

**3. Prerequisites**

- 3.1 Radioactive Material Area(s) Responsible Persons shall have at a minimum Radiological Worker I and be familiar with this procedure.

**4. Precautions**

- 4.1 Radioactive Waste Disposal Bags and Labels shall meet criteria for disposal per Standard Based Management System (SBMS) Subject Area “Radioactive Waste Management” (Reference 6.7).

**Note:**  
The “Radioactive Waste Management” labels may not have blanks available for all the information required to be on a tag per step 5.2 of this procedure. Additional information can be inserted on the tag or label as needed.

- 4.2 Outdoor storage of radioactive material is discouraged but may be necessary.
  - 4.2.1 In cases where outdoor storage is necessary, the integrity of containment and covers shall be periodically evaluated to ensure the prevention of degradation of the material or its containment from weathering and subsequent release of radioactive material.
- 4.3 Storage of non-radioactive material in RMA(s) is discouraged.
- 4.4 Radioactive material should be stored in a manner that reduces combustible loading. The use of cardboard containers for storage is discouraged.
- 4.5 Large amounts of flammable or combustible materials should not be stored adjacent to RMA(s).
- 4.6 Fire protection measures, such as smoke detectors, water sprinklers, and fire extinguishers should be considered when establishing RMA(s).
- 4.7 One or more of the following are preferred alternatives to long-term storage of radioactive material: decontamination, transfer, declaration as excess/scrap, or disposal.

## 5. Procedure

- 5.1 In areas where activation/contamination is possible, or in areas posted as a Radioactive Buffer Area, Contamination Area, High Contamination Area, or Airborne Radioactivity Area, all material and equipment being removed from the RMA shall be:
  - 5.1.1 Surveyed for possible release by appropriately trained FS personnel as per FS-SOP-1000 (Reference 6.5).
  - 5.1.2 Appropriately packaged by owner / user to prevent spread of contamination or unnecessary exposure.
  - 5.1.3 Tagged or labeled with a Radioactive Material Tag or Label, if required.
  - 5.1.4 Transported by properly trained individuals.
- 5.2 It is required that radioactive material tags have items 5.2.1 through 5.2.8 and desirable to have 5.2.9 and 5.2.10 (unless labeling/tagging exemptions listed in (Attachment 7.4) applies):
  - 5.2.1 Contact dose rate level.
  - 5.2.2 30-cm dose rate level.
  - 5.2.3 Removable surface contamination level (specify Beta-Gamma, Alpha).
  - 5.2.4 Name of the surveyor.
  - 5.2.5 Date of the radiation and contamination surveys.
  - 5.2.6 Description of the item.
  - 5.2.7 Radiation Instrument Type and ID.
  - 5.2.8 Contamination Instrument Type and ID.
  - 5.2.9 Responsible Person.
  - 5.2.10 Date the material entered storage (if known, enter date and if unknown, state "Unknown").

**Note:**

FS is responsible for the information (as listed in 5.2.1 through 5.2.8 (above) on one side of the tag, while the owner/generator/responsible individual for the item supplies the information on the other side of the tag (as listed in 5.2.9 and 5.2.10 (above)).

- 5.3 Once the RAM tag is complete, remove the paper copy and return to the FS Representative or designee for review and signature. Maintain the paper copy as a documented survey. Attach the cardboard copy to the RAM.
- 5.4 Contact the FS Representative for direction on labeling radioactive material that is too small for RAM tags or labels.
- 5.5 Radioactive Materials shall be tagged or labeled at all times except for the materials listed in Attachment 7.4, "Exempt Material" and as stated below.

**Note:**

Although "specific labeling" may not be required, controls to ensure radioactive materials are not improperly removed from the RMA need to be in place. This could be accomplished on the RMA posting with a qualifying statement such as "HP survey required for removal of material from this area" or "Activation Check Required".

- 5.5.1 Radioactive materials used, handled or stored in a posted RMA are exempt from labeling and tagging requirements provided that:
  - 5.5.1.1 Sufficient information is available to allow individuals to take adequate protective measures (RMA posting, training and non-radiological work permits are deemed to provide adequate information);
  - 5.5.1.2 Appropriate controls are established over the storage, movement and use of unlabeled or untagged items and containers as necessary to limit exposure consistent with the ALARA principle.
- 5.6 Potentially contaminated installed system piping and equipment is exempt from labeling provided it is within a properly posted area.
- 5.7 Installed system piping and equipment outside of controlled areas shall be labeled to identify the hazard.
- 5.8 Acceptable wording for labeling of installed system piping and equipment includes, but is not limited to:
  - Potential Internal Contamination
  - Internal Contamination
- 5.9 The C-AD Supervisor who owns the long-term Radioactive Material Area(s) (RMAs) shall:
  - 5.9.1 Ensure radioactive material is appropriately packaged, tagged, or labeled;

- 5.9.2 Check Tags and labels to ensure completeness and legibility. Contact FS Staff to correct any discrepancies;
- 5.9.3 Segregate into “like” radiological materials and ensure that liquids are in secondary containers (e.g. sections for liquids sources, bags), (Reference 6.7);
- 5.9.4 Know the name of the individual responsible for each radioactive material item contained within the RMA(s);
- 5.9.5 Contact the material’s responsible person to determine the need for disposal of material that has remained in the RMA for over a year.
- 5.9.6 Generate an inventory list for long-term RMA(s) on Attachment 7.1 and update it at least annually; (Refer to Attachment 7.3, Instructions for Long-Term RMA Inventory).
- 5.9.7 Perform annual inspection(s) for long term RMA(s) and document the inspection(s) on Attachment 7.2;
- 5.9.8 Review Decay-in-Storage records for material that should be evaluated by a Radiological Control technician for possible disposal;
- 5.9.9 Obtain a source list from the Source Custodian (as necessary);
- 5.9.10 Notify the Dept./Div. Source Custodian when a sealed/unsealed source within your RMA;
  - Has changed Dept./Div. Ownership
  - Has changed RMA location
  - Is removed for disposal per SMBS Subject Area “Sealed Radioactive Source Control” (Reference 6.2).
- 5.9.11 Provide inventory records for the long-term RMA(s) to ESSHQ Division;
- 5.9.12 Transfer records to Facility Support upon closure/de-posting of a long-term RMA (done by ESSHQ Division);
- 5.9.13 Notify the ESSHQ Division Head when RMA has received final closure.
- 5.10 Facilities Support (FS) Representatives/Radiological Control Technicians shall:
  - 5.10.1 Define RMA Boundaries with rad rope/tape or other appropriate method as defined by FS-SOP-3000 (Reference 6.9);
  - 5.10.2 Post-current radiological conditions per the BNL Rad Con Manual (Reference 6.4);

5.10.3 Survey material, as necessary, prior to the release from the area in accordance with FS-SOP-1000, and FS-SOP-1005 (References 6.5 and 6.8);

5.10.4 Receive/retain inventory records for long-term RMAs that are closed out/de-posted in accordance with SBMS Records Retention Subject Area.

## **6. References**

- 6.1 [SBMS Subject Area “Work Planning and Control for Experiments and Operations”](#).
- 6.2 [SBMS Subject Area, “Sealed Radioactive Source Control”](#).
- 6.3 HP-SOP-026, “Procurement of Radioactive Material”.
- 6.4 BNL Radiological Control Manual.
- 6.5 HP-SOP-1000 Radiological Survey Techniques.
- 6.6 Title 10 Part 835 of the Code of Federal Regulations.
- 6.7 Radioactive Waste Management SBMS Subject Area.
- 6.8 FS-SOP-1005, “Release of Materials from Areas Controlled for Radiological Purposes”.
- 6.9 FS-SOP-3000, “Radiological Posting Requirements”.

## **7. Attachments**

- 7.1 FS Form 3010.1, Radioactive Material Area (RMA) Inventory Form.
- 7.2 FS Form 3010.2, Inspection Checklist of Radioactive Materials Area.
- 7.3 Instructions for Long-Term RMA Inventory.
- 7.4 Exempt Material from Labeling and Tagging.



**Attachment 7.2**  
**INSPECTION CHECKLIST OF**  
**RADIOACTIVE MATERIALS AREA**

Department/Division	RMA Location	Responsible Person	Date
Status	Sat	Unsat	N/A
<i>Document Comments / Corrective Actions (as needed):</i>			
1. Area is clearly posted "Radioactive Material Area":			
2. Area is roped off or otherwise demarcated:			
3. Current dose rates are posted			
4. Entry/Exit Point is clearly marked and posted			
5. Aisles are unobstructed, allowing access to all containers			
6. All sinks and floor drains in the area are plugged			
7. Radioactive materials are segregated by classification			
8. All material is placed in proper containers in good condition			
9. All radioactive materials containers are closed and sealed			
10. All radioactive material bags are J-sealed			
11. All labels are properly completed			
12. All liquid radioactive material is placed in secondary containment			
13. Liquid radioactive materials are stored to prevent freezing			
14. All material is documented on the Dept/Div Inventory List			
15. Items previously identified for disposal have been removed			
16. Sealed/Unsealed Sources are documented on the Master Inventory			
17. Department Source Custodian notified			

Inspectors Name  
(Print/Signature) \_\_\_\_\_

Date \_\_\_\_\_

Page \_\_\_\_ of \_\_\_\_

**Attachment 7.3**  
Instructions for Long-Term RMA Inventory

ESSHQ Division Tickler Card #404 requires the owners of long-term RMA(s) to generate an inventory list for each RMA, updating it at least annually and forwarding a list of sealed/unsealed sources within the RMA(s) to the responsible Dept./Div. Source Custodian.

The following is a description of entries required in each block of Attachment 7.1:

Block #	Required Information
1.	Enter the name of the department or division responsible for the long-term RMA.
2.	Enter the specific location of the RMA (i.e. Building 801 mezzanine south side, etc.).
3.	Enter the name of the individual owner of the RMA.
4.	Enter the date that the inventory was started.
5.	Enter the date the item was added to the RMA inventory.
6.	Enter a clear description of the item including serial number if possible. For bulk items, or non-serialized items, it is permissible to use a bulk description (e.g. 100 lead shield bricks 3"x2"x6" or 50 $\text{lm}^3$ concrete shield blocks).
7.	Fill in for all solid items.
8.	Fill in for all liquids.
9.	Enter the primary radionuclide only (nuclide may be taken from known source term or by direct measurement).
10.	Enter the approximate curie content (value may be obtained from FS based on dose rate or may be calculated using Microshield or other computational program), or enter the maximum 30cm dose rate.
11.	This entry is only required for decay in storage items. Start date shall be date item was placed in RMA. End date shall be the date item was removed from RMA.
12.	Enter date transfer to another RMA was requested, or date RWCF was submitted.
13.	If item has been transferred out of the RMA or disposed of as waste, record date of removal.
14.	Enter RWCF number if assigned (N/A this block if item is not waste).
15.	Enter the date the responsible Source Custodian was notified. (The Source Custodian shall be notified annually of all sealed and unsealed sources stored in the RMA.) (Indicate N/A if the item is not a source.)
16.	Enter name of individual performing inventory.
17.	Enter date inventory was completed.
18.	Enter page number.
19.	Enter total number of inventory pages used.

**Attachment 7.4**  
**Exempt Material from Labeling and Tagging**

1. Radioactive materials used, handled or stored in areas posted and controlled in accordance with the Rad Con Manual Chapter 2, with sufficient information provided to permit individuals to take precautions to avoid or control exposures. Radiological Work Permits (RWPs) provide this control for entry into radiological areas. For those areas not controlled by RWP amplifying information should be available, such as: 1) Notify HP prior to entry or activation check required added to area posting, or 2) Place a copy of the most recent area survey at the entrance.
2. Radioactive material, or containers packaged and labeled for off-site shipment in accordance with Department of Transportation (DOT) Regulation (49 CFR 173 Subpart I), or Department of Energy (DOE) Order (DOE ) 460.1A).
3. Personnel protective equipment and clothing worn or used in a contamination Area; however, the package or container should be labeled.
4. Radiological samples such as air, process and soil samples, or swipes that are in the custody of the Facility Support personnel, or individuals properly trained in the handling, packaging and transport of these samples. Samples shipped off-site must be labeled as required by DOT and DOE Regulation/Order.
5. Equipment or installed system components undergoing maintenance covered by a RWP.
6. Portable tools and equipment with fixed contamination permanently marked with yellow or magenta, and maintained in a contaminated tool crib or storage and distribution area, which is designated as a Radioactive Material Area.
7. Installed system components located within an area, with the entrance posted in accordance with the "Criteria for Posting Radiation Areas", Radcon Manual Table 2-3, (Example: Activated components installed in a system contained within a posted Radiation Area).
8. Consumer items that emit radioactivity allowable under a general license (10CFR30, Part 34) and are deemed safe for the intended application, (i.e. fire/smoke detectors, exit signs, luminous dial watches, etc.).
9. Commercial Items and materials that contain enhanced amounts of naturally occurring radioactive materials for reasons other than to cause them to be radioactive, (e.g., lantern mantels, thoriated welding rods, uranium glass, uranium ceramic glazes, etc.).
10. Items or material removed from a controlled area as radioactive waste provided the outer container of this waste is properly labeled.
11. Short-lived (half-life of 2-hour or less), radioactive material generated during an irradiation that is immediately used (e.g., research sample while an experiment is being conducted).
12. Naturally radioactive environmental samples, such as ore samples, sand, soil, vegetation or minerals.