



George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

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ORGANIZATIONAL WORK INSTRUCTION

EM50 Strontium-90 Source Handling and Storage Baseline

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VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

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STRONTIUM-90 SOURCE HANDLING

1. SCOPE

1.1 Scope

This document establishes the standard handling procedure for EM50's strontium-90 source manufactured by QSA Global Incorporated, product code SIF-1177, NRC SSTR Model number SIF.D1, serial number OE696 located in Building 4605 Space Environmental Effects Laboratory.

1.2 Purpose

The purpose of this document is to outline the steps necessary for storing, handling, and moving the strontium-90 source.

1.3 Applicability

This document only applies to the EM50 strontium-90 source in Building 4605. This operating procedure is not a substitute for formal training in radiation safety. Untrained personnel shall not attempt to use this document.

2. APPLICABLE DOCUMENTS

MPR 1860.1 MSFC Radiation Safety Procedural Requirements
 MPD 1860.2 Radiation Safety Program
 MPR 1040.3. MSFC Emergency Plan.
 MPR 1840.2. MSFC Hazard Communication Program.
 MPR 8715.1. MSFC Safety, Health, and Environmental (SHE) Program.
 MWI 3410.1. Personnel Certification Program.
 MWI 8621.1. Close Call and Mishap Reporting and Investigation Program.

Note: Personnel shall always refer to the most current version of the above documents.

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3. DEFINITIONS

3.1 Definitions

3.1.1 Strontium-90 - a radioactive isotope emitting an energy spectrum of beta particles.

3.1.2 Beta particles - electrons emitted from the nucleus of an atom in the process of radioactive decay of an element.

3.1.3 Authorized User - the person listed on the Nuclear Regulatory Commission (NRC) license for the strontium-90 source.

3.1.4 Certified User - a person who has been trained in accordance with section 5 of this procedure and has been approved by the EM50 Supervisor.

3.2 Acronyms

3.2.1 TLD - Thermo Luminescent Dosimetry

3.2.2 RSO - Radiation Safety Officer

3.2.3 ALB - Acrylic Lock Box

3.2.4 NRC - Nuclear Regulatory Commission

4. INSTRUCTIONS

4.1 Storage

4.1.1 The strontium-90 source shall be secured in a source holder (see figure 4.1.1.1). The source holder shall have a removable 0.5-in. minimum thick acrylic shield (see figure 4.1.1.2) placed on the front of the holder when the source is not in use. (see figure 4.1.1.3)

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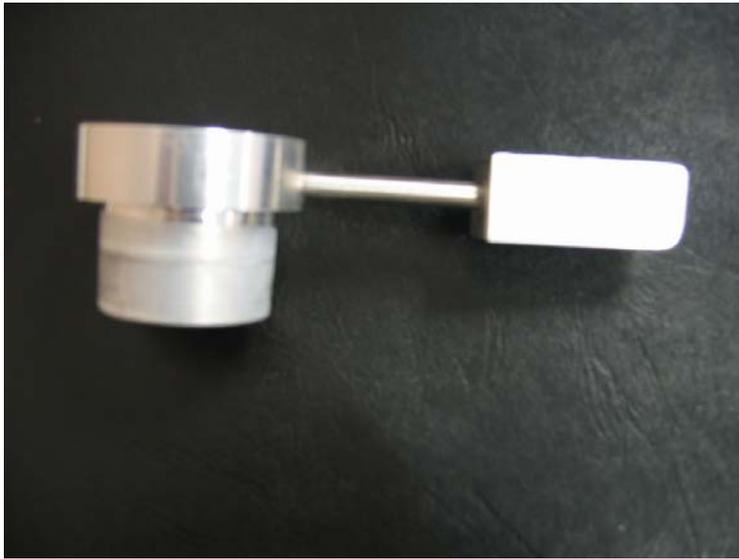


Figure 4.1.1.1 Strontium-90 source holder



Figure 4.1.1.2 Acrylic Shield

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Figure 4.1.1.3 Acrylic shield placed on source holder.

4.1.2 When not installed in a sample exposure system, the source shall be stored in a locked Benchtop Beta Acrylic Lock Box (ALB) manufactured by Nalgene (mfr#6850-0001) and distributed by Fischer Scientific, catalog number 14-293-64 (see figure 4.1.2). This container is sufficient to attenuate all beta particles from the source.

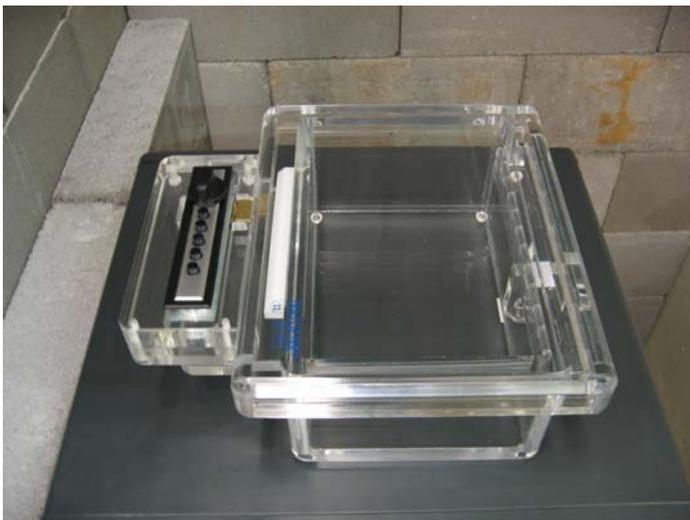


Figure 4.1.2 Acrylic Lock Box

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4.1.3 The ALB shall be stored in a locked safe (see figure 4.1.3) when not being used to transport the strontium-90 source from its storage location to a sample exposure system.



Figure 4.1.3 Locked Safe

4.1.4 The locked safe shall be located in Building 4605, Room 14. The safe shall be imbedded in a concrete block shielding wall.

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4.2 Transportation and Handling

4.2.1 The source holder shall be moved by one person and monitored by another person. These are the only two people permitted in the restricted area defined by the Radiation Safety Officer (RSO) during transportation and handling of the source.

4.2.2 The strontium-90 source shall be transported in the ALB between the safe and the sample exposure system where it is to be used.

4.2.3 The strontium-90 source shall only be handled by certified personnel listed on the certification list. The certification list shall be kept by the EM50 Supervisor and a copy of the certification list shall be attached to the safe. Certification shall be in accordance with training defined in section 10.0.

4.2.4 The strontium-90 source shall be handled by the source holder with the acrylic shield placed in front of the source holder. At no time shall the source be removed from the source holder without the presence and direction of the Radiation Safety Officer (RSO).

4.2.5 The ALB shall not be opened until the sample is ready to be installed into the sample exposure system.

4.2.6 The source holder shall be moved between the ALB and the sample exposure system as quickly as practical.

4.2.7 The person moving the source holder shall wear a finger ring dosimeter on each hand, safety glasses or goggles, and Thermo Luminescent Dosimetry (TLD).

4.2.8 The person monitoring the transportation of the source shall wear a TLD. This monitor shall hold a survey meter and monitor and record local radiation levels near the source. Radiation levels at the ending location shall be recorded on the source location chart. (see table 4.2.8)

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Figure 4.2.10.1 Source Holder Bracket

4.2.11 The sample exposure system shall be closed immediately upon removal of the Acrylic shield.

4.2.12 When the sample exposure is completed, the Acrylic shield shall be moved in front of the source immediately upon opening the sample exposure system and before any other handling operations.

4.2.13 The source holder shall immediately be placed inside the ALB upon removal from the sample exposure system. The ALB shall then be immediately placed inside the safe so that the source window is pointed towards the back of the safe.

4.2.14 The exposure system shall not be opened until the source has been returned to the safe and the swipe test as performed in step 4.2.15 has been determined to be acceptable.

4.2.15 A swipe test shall be performed on the interior of the exposure system near the source holder bracket.

4.2.15.1 The swipe test shall be performed by a certified user.

4.2.15.2 The certified user shall wear polymer or latex type gloves.

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4.2.15.3 A Q-tip or other suitable wipe shall be rubbed on the interior surface of the system piping and a Geiger-Mueller (GM) survey meter shall be used to check the Q-tip for residual radioactive material.

4.2.15.4 Residual radioactive material would indicate a leak from the source itself. Any indication above normal background shall be recorded in the notes column of the source location chart.

4.2.15.5 If a reading above normal background is detected showing contamination is discovered, the RSO and the authorized user shall be notified immediately. The Q-tip and gloves shall be isolated in the area of contamination. The area shall be closed off until the exposure system has been decontaminated and cleared by the RSO or Authorized User. Care shall be taken to prevent the spread of contamination to personnel and other equipment or areas.

4.3 Source Location Chart

4.3.1 A chart listing the location of the strontium-90 source shall be kept at the safe at all times. (see table 4.2.8).

4.3.2 The location chart shall include the initial location of the source, the final location of the source, the start and ending time of transporting the source, the date that it was moved, the signatures of both people involved in transporting the source, and any notes.

5. Notes

5.1 The strontium-90 source shall be kept in either the safe or the sample exposure system at all times except for the brief period during transportation between the safe and the sample exposure system.

5.2 Warning Signs

5.2.1 Proper radiation/radioactive material warning signs or stickers shall be placed at locations defined by the RSO. These locations shall included but not be limited to room 14 entrances, the sample exposure system, the ALB, and the Safe.

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5.3 Appropriate Use

5.3.1 All uses of this source shall be in compliance with the applicable requirements listed in MPD 1860.2, Radiation Safety Program, and MPR 1860.1, MSFC Radiation Safety Procedural Requirements.

6. Safety Precautions and Warning Notes

6.1 Hazards

6.1.1 MSFC adopts the policy of As Low As Reasonably Achievable (ALARA) and therefore transportation time when moving the source shall be kept as short as possible.

6.2 Safety Precautions

6.2.1 The RSO, Authorized User, or Certified User shall survey the area around the safe with the strontium-90 source inside the safe each time the source is returned to the safe.

6.2.2 The area around the sample exposure system with the strontium-90 source in place shall have a radiation survey performed by the RSO, Authorized User, or Certified User each time the source is placed into the sample exposure system.

6.2.3 The RSO or Authorized User shall designate areas which shall be restricted from personnel access while the source is being transported and while the source is in the sample exposure system.

6.2.4 Restricted areas shall be properly marked and the boundaries reset each time the source is moved to the sample exposure system.

6.2.5 The boundary markings shall be removed after the source is returned to the safe.

6.2.6 The strontium-90 source shall not be left in the sample exposure system unless the system is secured.

6.2.6.1 The sample exposure system may be secured by several methods designed to ensure the source is difficult to remove.

6.2.6.2 Security measures may include keeping the sample exposure system under a vacuum, placing locks on hatches

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to prevent access to the interior of the system, or using bolted flanges instead of a hatch door on the system.

6.2.7 The RSO shall coordinate TLD and finger ring dosimetry evaluations as required.

6.3 Accident Reporting

6.3.1 Should the source for any reason come out of its source holder, or should the shield come off during handling, the room that the source is in shall be evacuated immediately and secured against inadvertent access by personnel. The RSO, and Authorized user, shall be contacted immediately. Any recovery of the source shall be at the direction of the RSO or Authorized User.

6.4 Emergency Response Plan

6.4.1 In the event of an emergency, contact the RSO at 544-5738 or beeper 551-5732.

6.5 Mishap Reporting

6.5.1 Mishaps shall be reported in accordance with MWI 8621.1

7. Attachments, Data, Reports, and Forms

No attachments, data, reports, or forms are used with this procedure.

8. Records

8.1 Source Location Chart

8.1.1 A chart (Table 4.2.8) delineating the location of the strontium-90 source shall be attached to the outside of the safe.

8.1.2 Completed Source Location Charts shall be kept by the EM50 supervisor for three years.

8.2 Certification List

8.2.1 A list of all certified users shall be kept by the EM50 Supervisor and a copy shall be attached to the outside of the safe.

9. Tools, Equipment, and Materials

9.1 No special tools, equipment or materials are needed to transport the strontium-90 source between the safe and the exposure chamber.

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10. Personnel Training

10.1 Personnel Safety Training

10.1.1 All personnel resident in Building 4605 shall complete Radiation Safety Training and shall have TLDs issued by the RSO. Additionally, the RSO shall train all building personnel on the particulars of the strontium-90 source.

10.2 Source Handling Certification

10.2.1 Before handling the strontium-90 source, personnel must be trained by the Authorized User and the RSO in all aspects of safe handling. Personnel shall be approved by the EM50 Supervisor to be qualified source handler before being allowed to handle or monitoring the handling of the source.

10.2.2 Copies of the letter of certification shall be kept by certified users, the (RSO), and the EM50 Supervisor in a central storage location.