

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR SAFETY AND SAFEGUARDS  
WASHINGTON, D.C. 20555

September 11, 1990

NRC INFORMATION NOTICE NO. 90-58: IMPROPER HANDLING OF OPHTHALMIC STRONTIUM-90  
BETA RADIATION APPLICATORS

Addressees:

All Nuclear Regulatory Commission (NRC) medical licensees.

Purpose:

This notice is intended to inform users of strontium-90 (Sr-90) eye applicators of improper handling practices that resulted in unnecessary radiation exposures to the skin. This notice also serves to remind licensees of the importance of handling devices in accordance with manufacturers' instructions. It is expected that licensees will review this information for applicability to their own procedures for Sr-90 eye applicator use, distribute this notice to those responsible for radiation safety and to users of the Sr-90 eye applicator, and consider actions, if appropriate, to preclude similar situations from occurring at their facilities. However, suggestions contained in this notice do not constitute any new NRC requirements, and no written response is required.

Description of Circumstances:

The following cases illustrate improper handling techniques for Sr-90 eye applicators:

Case 1: A physician sterilized the treatment end of a Sr-90 eye applicator, on six separate occasions, by touching its surface with alcohol swabs held in his fingers. The cumulative dose associated with this technique was estimated to be 50 rem to the fingertip; this is well in excess of the extremity dose limit of 18.75 rem per quarter.

Case 2: For years, a physician treated patients by opening the eyelids with his bare fingers and positioning the applicator. By handling a typical 100-millicurie eye applicator in this fashion, the dose to the fingers per treatment has been estimated to be 0.4 rem. A physician practicing under these circumstances would exceed the quarterly extremity dose limit of 18.75 rem by providing approximately 50 treatments per quarter, or 4 treatments per week.

Case 3: During routine inspection at a licensee's facility, the physician was asked to show his eye applicator to the inspector. The physician retrieved the applicator from its secured storage location and pointed it directly at the inspector, who was standing approximately 18 inches away

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from the unshielded source tip of the applicator. The radiation field from the applicator, 18 inches away, was approximately 13 rad per hour. To avoid unnecessary exposure, the applicator should always be shielded or pointed away from individuals, except during actual treatment.

Discussion:

All licensees are reminded of the importance of ensuring the safe performance of licensed activities in accordance with NRC regulations and the requirements of their licenses. Eye applicators are designed to deliver intense doses of beta radiation for the treatment of superficial eye diseases. The sealed source mounted on the tip of each applicator has a nominal activity of approximately 100 millicuries of strontium and yttrium-90 in equilibrium, and delivers a contact dose rate on the order of 60 rad per second.

The NRC dose limits for extremities (hands, forearms, feet, and ankles) and skin of the whole body are 18.75 rem and 7.5 rem per quarter, respectively. Contact between the source tip of the applicator and the skin could result quickly in a radiation dose in excess of NRC limits. Repetitive activities such as tip sterilization or positioning the applicator for treatment, when performed with bare hands and in close proximity to the tip of the applicator, over a period of several seconds per event, may result in radiation doses in excess of NRC limits. Therefore, compliance with NRC license commitments and manufacturers' handling instructions are important in maintaining exposure levels as low as reasonably achievable.

The cases described above illustrate an incomplete understanding of proper handling procedures and the skin exposures that could occur from improper handling. NRC regulations require that users of eye applicators evaluate potential safety hazards, ensure safe operations at their facilities, and follow manufacturers' and NRC's safe handling instructions, described below:

Typical Manufacturer's safe handling instructions:

1. Sterilize the applicator by either: (a) immersing the applicator in alcohol in a shielded container, or (b) placing a cotton swab, sponge, or gauze, dampened with a sterilizing agent, on a flat surface and wiping the treatment end of the applicator across the swab, sponge, or gauze, instead of holding it with the finger.
2. The applicator should only be held by its shielded handle, at all times. The beta shield should be positioned as close to the source as possible, during treatment, to minimize exposure to the user.
3. The active face of the applicator must not be viewed directly, but only through the shield provided, or equivalent protection.
4. Never point the unshielded treatment end of the applicator toward any individual, especially toward the eyes, except during patient treatment.

5. Use manufacturer-supplied handling tongs for the placement and removal of beam collimating masks on the applicator tip. The collimator masks should be fitted and removed with the source facing away from the user.
6. Always minimize the time that the applicator is out of the shielded storage container. The storage case should be locked and secured, to prohibit unauthorized access to the applicator.
7. In the event of apparent or probable damage to the source, it should immediately be placed into the storage case. The storage case should be wrapped or placed into a plastic bag and secured. The Radiation Safety Officer should be notified for consultation and action.

In addition to following the manufacturer's handling instructions, licensees are required to submit rules for safe handling of Sr-90 eye applicators at the time of license application, amendment, or renewal. Licensees may submit a copy of their own rules for safe handling, or NRC's "Rules for Safely Handling a Strontium-90 Eye Applicator," as described in "Information to be Submitted When Requesting Possession and Use of Sr-90 as Ophthalmic Applicator," dated March 1982, and listed below:

NRC's "Rules for Safely Handling a Strontium-90 Eye Applicator":

- \*1. Wear your personnel dosimeter(s) whenever you handle the Sr-90 eye applicator. Finger ring-type dosimeters should be worn with the detector on the palm side of the hand.
2. Remove the Sr-90 eye applicator from its secured storage location just before use. Do not leave it out any longer than necessary.
3. After removing the Sr-90 eye applicator from its secured storage location:
  - a. Do not touch the treatment end of the applicator with your hands or other portion of your body,
  - b. Always hold the applicator by its handle, and
  - c. Except during patient treatment, do not point the treatment end of the applicator toward another person, especially toward the eyes.
4. If the applicator is to be sterilized, place on a flat surface, use a cotton swab, sponge, or gauze dampened with a sterilizing agent, then wipe the treatment end of the applicator across the swab, sponge, or gauze. Do not sterilize by holding the swab or gauze in your hand.

\*It is strongly recommended that Thermoluminescent Dosimeter (TLD) ring or film type badges be worn when handling a Sr-90 eye applicator.

5. During treatment, hold the patient's eye lids open with tape or other device, not with your fingers.
6. Immediately after treatment and/or reesterilization, return the Sr-90 eye applicator to its storage container and to its secured location (e.g., locked cabinet).
7. Do not remove any metal or plastic inserts from the manufacturer-supplied storage container. These items are generally a part of the container's shielding. Removal of these items can lead to excessive and unnecessary radiation exposures.

No written response is required by this information notice. If you have any questions about this matter, please contact the appropriate regional office or this office.

*Richard E. Cunningham*

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Attachments:

1. List of Recently Issued NMSS  
Information Notices
2. List of Recently Issued NRC  
Information Notices

LIST OF RECENTLY ISSUED  
NMSS INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to:
90-38	Requirements for Processing Financial Assurance Submittals for Decommissioning	05/29/90	All fuel facility and materials
90-35	Transportation of Type A Quantities of Non-Fissile Radioactive Materials	05/24/90	All U.S. Nuclear Regulatory Commission (NRC) Licensees
90-31	Update on Waste Form and High Integrity Container Topical Report Review Status, Identification of Problems with Cement Solidication, and Reporting of Waste Mishaps	05/04/90	All holders of operating licenses or construction permits for nuclear power reactors, fuel cycle licenses, and certain byproduct materials licenses
90-27	Clarification of the Recent Revisions to the Regulatory Requirements for Packaging of Uranium Hexafluoride (UF <sub>6</sub> ) for Transportation	04/30/90	All Uranium Fuel Fabrication and Conversion Facilities
90-24	Transportation of Model SPEC 2-T Radiographic Exposure Device	04/10/90	All NRC licensees authorized to use, transport, or operate radiographic exposure devices and source changers
90-20	Personnel Injuries Resulting from Improper Operation of Radwaste Incinerators	03/22/90	All NRC licensees who process or incinerate radioactive waste
90-16	Compliance with New Decommissioning Rule	03/07/90	All materials licensees
90-15	Reciprocity: Notification of Agreement State Radiation Control Directors before Beginning Work in Agreement States	03/07/90	All holders of NRC materials licenses that authorize use of radioactive material at temporary job sites

LIST OF RECENTLY ISSUED  
 NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
90-57	Substandard, Refurbished Potter & Brumfield Relays Misrepresented As New	9/5/90	All holders of OLs or CPs for nuclear power reactors.
90-56	Inadvertent Shipment of A Radioactive Source In A Container Thought To Be Empty	9/4/90	All U.S. Nuclear Regulatory Commission (NRC) licensees.
90-55	Recent Operating Experience on Loss of Reactor Coolant Inventory While In A Shutdown Condition	8/31/90	All holders of OLs or CPs for nuclear power reactors.
83-44 Supp. 1	Potential Damage to Redundant Safety Equipment As A Result of Backflow Through the Equipment and Floor Drain System	8/30/90	All holders of OLs or CPs for nuclear power reactors.
90-54	Summary of Requalification Program Deficiencies	8/28/90	All holders of OLs or CPs for nuclear power reactors.
89-18 Supp. 1	Criminal Prosecution of Wrongdoing Committed by Suppliers of Nuclear Products or Services	8/24/90	All holders of OLs or CPs for nuclear power reactors.
90-53	Potential Failures of Auxiliary Steam Piping and the Possible Effects on the Operability of Vital Equipment	8/16/90	All holders of OLs or CPs for nuclear power reactors.
90-52	Retention of Broken Charpy Specimens	8/14/90	All holders of OLs or CPs for nuclear power reactors.
90-51	Failures of Voltage-Dropping Resistors in the Power Supply Circuitry of Electric Governor Systems	8/8/90	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License  
 CP = Construction Permit

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*\* See previous CONCURRENCE*

OFC: IMAB	:Tech Ed#	:IMAB #	:IMAB*	:DD:IMNS*	:D/IMNS*
NAME: JSchluter:js/ht	:EKraus	:LWCamper	:JEGlenn	:GSjoblom	:RECunningham
DATE: 08/6/90 9	:08/ /90	:08/ /90	:08/ /90	:08/ /90	:08/ /90

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- c. Except during patient treatment, do not point the treatment end of the applicator toward another person, especially toward the eyes.
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NAME: JSchlueter:js	:EKlaus	:LWCamper	:JBTenn	:GSJobTom	:RECunningham
DATE: 08/30/90	:08/29/90	:08/30/90	:08/30/90	:08/30/90	:08/31/90