

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
WASHINGTON, DC 20555

October 26, 2004

NRC INFORMATION NOTICE 2004-18: RECENT SAFETY-RELATED EVENT AT
PANORAMIC WET-SOURCE-STORAGE
IRRADIATOR

Addressees:

All licensees authorized to possess and use sealed sources in panoramic wet-source-storage irradiators, and irradiator vendors.

Purpose:

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to inform addressees of a recent safety-related incident at a panoramic wet-source-storage irradiator. It is expected that recipients will review this notice for applicability to their facilities and consider actions, if appropriate, to avoid similar problems. However, suggestions contained in this IN are not new NRC requirements; therefore, no specific action nor written response is required.

Description of Circumstances:

On April 21, 2004, an event occurred at an NRC-licensed panoramic wet-source-storage pool irradiator used for sterilization of medical supplies. The irradiator contains two source racks that operate simultaneously, each containing approximately 74 petabecquerel (2 million curies) of cobalt-60, for a total of 148 petabecquerel (4 million curies). The irradiator operator was experiencing problems with the source rack upper-limit switch (up-switch) and attempted to repair it. The up-switch's function is to signal when the source racks are in the raised, exposed position. Faults occurred after repeated attempts to fix the switch when the sources were raised to test the repair, causing the safety interlocks to prevent access to the irradiation room. The alternate radiation safety officer (ARSO) authorized the irradiator operator to defeat the safety interlocks; enter the irradiator via the product exit barrier door; walk through the irradiation room (e.g., room where source racks and pool are located); and open the locked personnel access maze door from inside the room. Defeating safety interlocks to enter the irradiator had been a practice at this facility for a number of years. The repair required the use of a ladder, which was placed over the source pool (adjacent to the rack hoist mechanism). After multiple repair attempts failed during a 6-hour period, the operator forgot to remove the ladder, and with the supervision of the ARSO, raised and lowered the source racks to test the repairs that had been made. However, unknown to the operator or ARSO, the ladder jammed against one of the source racks, preventing it from lowering into the pool and into the safe, shielded position. The operator and ARSO incorrectly assumed that the control panel indication of an exposed source rack was a continuation of the source rack switch problem. They believed it was yet another false indication. Based on this incorrect understanding, the ARSO again authorized the irradiator operator to defeat safety interlocks and enter the irradiator via the product exit barrier door.

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The operator enlisted the assistance of a materials handler and they entered the irradiator. The materials handler was not wearing required dosimetry for this entry. On entering the irradiator, with only one wall of concrete separating them from direct exposure to the stuck source rack, the operator noticed an unexpectedly high reading on the survey meter and told the material handler to leave immediately. After leaving the irradiator, the operator informed the ARSO of the unexpected radiation levels. The two workers received doses of 44 and 28 millisievert (4.4 and 2.8 rem), respectively, in a matter of seconds.

NRC conducted a special inspection to respond to this event and, upon learning of the potential for occupational exposure significantly in excess of regulatory limits, dispatched an Augmented Inspection Team (AIT) to the site. The team was charged with reviewing the circumstances of the event and determining root causes. Documentation of these inspections can be found in NRC Inspection Reports 03019882/2004002 [Agencywide Documents Access and Management System (ADAMS) Accession No. ML041820011] and 03019882/2004003 [ADAMS Accession No. ML0420300490].

The NRC AIT identified the following:

The licensee did not implement its emergency procedures under conditions that required them to be implemented.

The licensee did not perform surveys that were adequate to ensure that sources were in a safe storage condition before defeating safety interlocks and entering the irradiator, although the emergency procedures required this. The irradiator operator did perform a survey, but did not identify elevated radiation levels before entering the product exit barrier door. Elevated levels were detected inside the interim area, with only a concrete wall separating the operator and assistant from the room with the stuck source rack. Even without implementing the emergency procedure, good radiation safety practices would have required appropriate radiation surveys before entering the room.

Defeating safety interlocks and entering the irradiation room via the product exit barrier door and into the interim area of the irradiator had become common practice at this facility.

Persistent maintenance problems may have existed with the switch systems; however, problems were repaired individually and the licensee did not identify trends nor determine if underlying causes existed for the problems, nor if preventive maintenance would have reduced the number of problems.

Licensee personnel did not have a complete understanding of the operation and use of the irradiation room's radiation monitor. For instance, when the source rack is in the exposed position, the operator could have depressed the monitor test switch on the control console to verify if the source racks were exposed or shielded. During this event, the licensee did not use this feature, which could have prevented personnel from entering the interim area and receiving an unnecessary dose.

There was no clear guidance in the licensee's operating procedures as to when to engage the emergency procedures, except during start-up.

Annual safety training did not always include performance of a drill. When a drill was done, the same exit maze scenario was used each time. Therefore, the operators were not drilled on any of the other nine emergency conditions, such as a stuck source rack event.

Discussion:

At irradiators, adherence to requirements is critical, because the sources of radiation involved are capable of delivering life-threatening exposures. If the two employees had continued on their intended path instead of turning around when they identified elevated radiation levels, each individual could have received a dose of at least 4.5 gray (450 rad), a potentially lethal exposure. To be properly protective of health and safety, it is important that licensee management strongly emphasize safety as the highest priority, accompanied by training, adherence to procedures, attention to detail, critical self-assessment, and a questioning attitude toward safety.

Events regarding exposure of personnel and source rack jams, like the ones just described, are preventable. NRC expects licensees to train their personnel to recognize an emergency, when to engage their emergency procedures, and how to prevent a stuck source rack from occurring. NRC also expects that licensees will not defeat safety interlocks. Safety interlocks are designed to ensure the safety of personnel from the intense radiation fields at irradiators. If the access door(s) are locked, it is important to engage your emergency procedures to verify the location of the source racks and associated irradiation room dose rates. For this type of irradiator, this could have been done by: (a) checking the position of the source hoist cables from inside the penthouse area; (b) verifying known "hot spots" around the irradiator with an operable survey meter; and/or (c) depressing the monitor test switch on the control console to check for elevated radiation levels inside the cell.

If appropriate actions, such as the above, indicate that the source racks are in their safe shielded position, but the interlocks still continue to prevent access, licensees should contact the irradiator manufacturer to: (1) determine the cause of the interlock activation and (2) to discuss proper actions to pursue maintenance and repair. The irradiator manufacturer may provide detailed instructions for entering the irradiator if safety interlocks must be defeated. However, this manner of entry is only to be used when absolutely necessary and is not an accepted routine. As noted above, entry into the irradiator in this case delivered unintended doses to two individuals because the above steps were not completed, and could have resulted in lethal doses.

Although individual licensees are not required to take specific action, they should consider reviewing the contents of this IN with those responsible for irradiator operations, to reinforce the need and importance of a fully functional radiation safety program that ensures the safety of its employees.

This IN requires no specific action nor written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate regional office.

/RA/

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Attachments:

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

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
2004-17	Loose Part Detection and Computerized Eddy Current Data Analysis in Steam Generators	08/25/2004	All holders of operating licenses for pressurized-water reactors (PWRs), except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor.
2004-16	Tube Leakage Due to a Fabrication Flaw in a Replacement Steam Generator	08/03/2004	All holders of operating licenses for pressurized-water reactors (PWRs), except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor.
2004-15	Dual-Unit Scram at Peach Bottom Units 2 and 3	07/22/2004	All holders of operating licenses for nuclear power reactors except those who have permanently ceased operation and have certified that fuel has been permanently removed from the reactor vessel.
2004-14	Use of less than Optimal Bounding Assumptions in Criticality Safety Analysis at Fuel Cycle Facilities	07/19/2004	All licensees authorized to possess a critical mass of special nuclear material.
2004-13	Registration, Use, and Quality Assurance Requirements for NRC-Certified Transportation Packages	06/30/2004	All materials and decommissioning reactor licensees.

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2004-03	Radiation Exposures to Members of the Public in Excess of Regulatory Limits Caused by Failures to Perform Appropriate Radiation Surveys During Well-logging Operations	02/24/2004	All well-logging licensees.
2004-02	Strontium-90 Eye Applicators New Calibration Values and Use	02/05/2004	All U.S. Nuclear Regulatory Commission (NRC) medical-use licensees and NRC master materials license medical-use permittees.
2003-22	Heightened Awareness for Patients Containing Detectable Amounts of Radiation from Medical Administrations	12/09/2003	All medical licensees and NRC Master Materials License medical use permittees.
2003-21	High-Dose-Rate-Remote-Afterloader Equipment Failure	11/24/2003	All medical licensees.

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