

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

September 13, 2007

NRC INFORMATION NOTICE 2007-30: RADIOLOGICAL CONTROLS CREATE
 CRITICALITY SAFETY ACCIDENT SCENARIO
 FOR FISSILE SOLUTION CONTAINER
 TRANSPORT AT FUEL CYCLE FACILITY

ADDRESSEES

All licensees authorized to possess a critical mass of special nuclear material.

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to inform addressees of a criticality safety concern regarding wrapping fissile solution filled vessels with plastic, for radiological control, while transporting the vessels within fuel cycle facilities. NRC expects that licensees will review this information and consider actions, as appropriate, to avoid similar problems. Suggestions contained in this IN are not NRC requirements; therefore, no specific action nor written response is required.

DESCRIPTION OF CIRCUMSTANCES

An NRC licensee operates a fuel cycle facility that processes and stores high-enriched uranium (HEU) in both solid and solution form. To clean floors in contaminated areas of the facility, the licensee typically places cleaning solution on the floor, scrubs the floor with an orbital scrubber, and then removes the solution with a large workshop-type vacuum cleaner. The vacuum cleaners have a volume of approximately 52 liters (14 gallons) and are filled with raschig rings, to allow any solution in the facility to be vacuumed from the floor. The raschig ring-filled vacuum cleaners are occasionally used to recover from large spills when collection of solution with sponges would be too slow. Concentrated HEU solutions containing up to 400 grams per liter of Uranium-235 (U-235) are allowed in raschig ring-filled vessels in the facility and such solutions have been transferred into the raschig ring-filled vacuum cleaners.

The licensee uses forklifts to transport the raschig ring-filled vacuum cleaners to various locations in the facility for floor cleaning. Most areas of the facility do not have equipment to remove and process floor cleaning solutions, so the licensee transports filled vacuum cleaners to another area to remove and process the contents. The licensee procedure for moving the raschig ring-filled vacuum cleaners involved: (1) removing the vacuum pump; (2) covering the vacuum cleaner vessel; (3) wrapping the vacuum cleaner vessel with two 55-gallon plastic bags; and (4) moving the wrapped vacuum cleaner with a fork lift by means of brackets welded to the vacuum cleaner frame (see Figure 1). Some of the raschig ring-filled vacuum cleaners in the licensee facility had the lifting brackets, some did not have the brackets, and the lifting brackets were not required to move the vacuum cleaners.

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Figure 1

Rashig Ring-filled Vacuum Cleaner Vessel with Lifting Brackets

A rashig ring-filled vacuum cleaner was requested to be moved to a specified location for a cleaning operation. The vacuum cleaner selected and wrapped for transport did not have the lifting brackets. During the operation to move the vacuum cleaner without lifting brackets, a licensee forklift operator picked up the vacuum with one forklift tine. The vacuum cleaner was removed from one area and carried to another area while another licensee operator balanced the vacuum cleaner on the single tine. At a doorway ramp near the destination, the vacuum cleaner fell off the forklift. A large fraction of the rashig rings spilled from the vacuum cleaner vessel and were retained by the inner wrapper. Most of the HEU solution in the vacuum cleaner vessel, approximately 18 liters (5 gallons), spilled from the vessel and was captured between the inner and outer wrappers, effectively separating the solution from the rashig rings. The risk-significance of the resulting upset condition was low because the concentration of the HEU solution was less than one gram per liter.



Figure 2

Dropped Raschig Ring-filled Vacuum Cleaner Final Position

Figure 2 shows the position of the dropped vacuum cleaner vessel. The vessel is halfway up the entrance ramp to the destination, with the top edge of the vessel lying at the edge of the ramp. The raschig rings and solution have spilled from the vessel out over the edge of the ramp which is approximately 3 to 4 inches high in that area. The double wrapped configuration and the final resting position hanging over the edge of the ramp have combined to create an unfavorable geometry vessel for the solution. Hanging downward allows a plastic bag or wrapper to assume a more unfavorable geometry than would be likely if the final resting position were a flat floor.

Subsequent investigation of the event revealed that: (1) no controls limited the concentration of solution in the vacuum cleaners; (2) raschig ring-filled vacuum cleaners were commonly transported while full of HEU solution; (3) licensee criticality safety staff did not routinely review radiological control procedures; (4) licensee criticality safety staff were unaware that the vacuum cleaners were transported while filled with solution; and (5) the licensee had not analyzed or controlled the transport process with respect to criticality safety.

DISCUSSION

Licensee criticality safety engineers indicated that, had they known that the raschig ring-filled vessels were being transported while filled with solution, they would have implemented controls to limit the uranium content of the vessels. Such controls might have included placing limits on solution concentration during transport, sampling the vessels before movement, or requiring a specific transport configuration.

The NRC is concerned that licensees recognize and completely analyze all potential accident sequences at their facilities. To this end, fuel cycle licensees typically require that criticality safety staff review procedures associated with movement of fissile material, including radiological control procedures.

The failure to review in-plant transport procedures and radiological controls can lead to the creation of an unanticipated accident sequence. NRC criticality safety inspections typically include review of the licensee criticality safety audit program, to ensure that analytical assumptions are regularly reviewed in all areas. NRC criticality safety inspections routinely review licensee facility operations to ensure that credible accident sequences have been identified, analyzed, and controlled.

CONTACT

This information notice does not require any specific action or written response. Please direct any questions about this matter to the technical contact below.

/RA/

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Enclosure:
List of Recently Issued FSME/NMSS Generic Communications

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OFC	FSCC/TSB	Tech ED	FSME	FCSS/TSB	FCSS	FCSS
NAME	DMorey	Ekraus: fax	AMcIntosh	DJackson	JGitter	RPierson
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Recently Issued FSME/NMSS Generic Communications			
Date	GC No.	Subject	Addressees
02/02/07	IN-07-03	Reportable Medical Events Involving Patients Receiving Dosages of Sodium Iodide Iodine-131 less than the Prescribed Dosage Because of Capsules Remaining in Vials after Administration	All U.S. Nuclear Regulatory Commission medical use licensees and NRC Master Materials Licensees. All Agreement State Radiation Control Program Directors and State Liaison Officers.
02/28/07	IN-07-08	Potential Vulnerabilities of Time-reliant Computer-based Systems Due to Change in Daylight Saving Time Dates	All U. S. Nuclear Regulatory Commission licensees and all Agreement State Radiation Control Program Directors and State Liaison Officers.
03/13/07	IN-07-10	Yttrium-90 Theraspheres® and Sirspheres® Impurities	All U.S. Nuclear Regulatory Commission (NRC) Medical Licensees and NRC Master Materials Licensees. All Agreement State Radiation Control Program Directors and State Liaison Officers.
04/04/07	IN-07-13	Use of As-Found Conditions to Evaluate Criticality-related Process Upsets at Fuel Cycle Facilities	All licensees authorized to possess a critical mass of special nuclear material.
05/02/07	IN-07-16	Common Violations of the Increased Controls Requirements and Related Guidance Documents	All licensees who are implementing the U.S. Nuclear Regulatory Commission (NRC) Order Imposing Increased Controls (EA-05-090), issued November 14, 2005 and December 22, 2005.
05/21/07	IN-07-19	Fire Protection Equipment Recalls and Counterfeit Notices	All holders of operating licenses for nuclear power reactors and fuel cycle facilities; except those licensees for reactors that have permanently ceased operations and who have certified that fuel has been permanently removed from the reactor vessel; and except those licensees for decommissioned fuel cycle facilities.
06/11/07	IN-07-20	Use of Blank Ammunition	All power reactors, Category I fuel cycle facilities, independent spent fuel storage installations, conversion facility, and gaseous diffusion plants.

Date	GC No.	Subject	Addressees
	IN-07-23	Inadvertent Discharge of Halon 1301 Fire-suppression System from Incorrect and/or Out-of-date Procedures	All holders of operating licenses for nuclear power reactors, except those who have permanently ended operations and have certified that fuel has been permanently removed from the reactor vessel. All holders of licenses for fuel cycle facilities.
07/19/07	IN-07-25	Suggestions from the Advisory Committee on the Medical Use of Isotopes For Consideration to Improve Compliance With Sodium Iodide I-131 Written Directive Requirements in 10 CFR 35.40 and Supervision Requirements in 10 CFR 35.27	All U.S. Nuclear Regulatory Commission (NRC) medical-use licensees and NRC Master Materials Licensees. All Agreement State Radiation Control Program Directors and State Liaison Officers.
08/13/07	IN-07-26	Combustibility of Epoxy Floor Coatings at Commercial Nuclear Power Plants	All holders of operating licenses for nuclear power reactors and fuel cycle facilities except licensees for reactors that have permanently ceased operations and who have certified that fuel has been permanently removed from the reactor vessel.
03/01/07	RIS-07-03	Ionizing Radiation Warning Symbol	All U.S. Nuclear Regulatory Commission licensees and certificate holders. All Radiation Control Program Directors and State Liaison Officers
03/09/07	RIS-07-04	Personally Identifiable Information Submitted to the U.S. Nuclear Regulatory Commission	All holders of operating licenses for nuclear power reactors and holders of and applicants for certificates for reactor designs. All licensees, certificate holders, applicants, and other entities subject to regulation by the U.S. Nuclear Regulatory Commission (NRC) of the use of source, byproduct, and special nuclear material
03/20/07	RIS-07-05	Status and Plans for Implementation of NRC Regulatory Authority for Certain Naturally-occurring and Accelerator-produced Radioactive Material	All NRC materials licensees, Radiation Control Program Directors, State Liaison Officers, and NRC's Advisory Committee on the Medical Uses of Isotopes
04/05/07	RIS-07-07	Clarification of Increased Controls for Licensees That Possess Collocated Radioactive Material During Transportation Activities	All U.S. Nuclear Regulatory Commission (NRC) licensees issued NRC's Order Imposing Increased Controls and all Radiation Control Program Directors and State Liaison Officers

Date	GC No.	Subject	Addressees
05/04/07	RIS-07-09	Examples of Recurring Requests for Additional Information (RAIs) for 10 CFR Part 71 and 72 Applications	All holders of, and applicants for, a: (1) 10 CFR Part 71 certificate of compliance (CoC) for a radioactive material transportation package; (2) 10 CFR Part 72 CoC for a spent fuel storage cask; and (3) 10 CFR Part 72 specific license for an independent spent fuel storage installation (ISFSI).
06/27/07	RIS-06-27, Suppl. 1	Availability of NRC 313A Series of Forms and Guidance for Their Completion	All U.S. Nuclear Regulatory Commission (NRC) medical-use licensees and NRC Master Materials licensees. All Radiation Control Program Directors and State Liaison Officers.
05/15/07	RIS-07-10	Subscriptions To New List Server For Automatic Notifications Of Medical-Related Generic Communications, <i>Federal Register</i> Notices And Newsletters	All U.S. Nuclear Regulatory Commission (NRC) medical-use licensees and NRC Master Materials licensees. All Radiation Control Program Directors and State Liaison Officers.

Note: A full listing of generic communications may be viewed at the NRC public website at the following address:
<http://www.nrc.gov/Electronic Reading Room/Document Collections/Generic Communications>