

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

November 22, 1989

NRC INFORMATION NOTICE NO. 89-78: FAILURE OF PACKING NUTS ON ONE-INCH  
URANIUM HEXAFLUORIDE CYLINDER VALVES

Addressees:

All U.S. Nuclear Regulatory Commission (NRC) licensees authorized to possess and use source material and/or special nuclear material for the heating, emptying, filling, or shipping of uranium hexafluoride in 30- and 48-inch diameter cylinders.

Purpose:

This notice is provided to advise licensees about incidents in which packing nuts on one-inch uranium hexafluoride cylinder valves were found to be cracked. It is expected that recipients will review the information for applicability to their activities, distribute it to responsible operations staff, and consider actions, if appropriate, to identify and correct similar occurrences 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:

Allied-Signal, Inc., has reported that cracks were observed in packing nuts on three one-inch valves designed for use in 30- and 48-inch diameter uranium hexafluoride cylinders. The cracks were discovered when the valves were removed from storage and visually inspected by the licensee. The affected valves were unused and had been in storage since receipt in early 1987 from the French firm, Descote. Both the U.S. Department of Energy (DOE) and the Canadian Atomic Energy Control Board have reported similar cracking in packing nuts on one-inch valves supplied by Superior Valve Company. However, unlike the Descote valves, the Superior valves were in service at the time the cracks were observed.

Cracked nuts on uranium hexafluoride cylinder valves can result in leakage of uranium hexafluoride through the packing material and valve stem.

DOE's contractor, Martin Marietta Energy Systems, Inc. (MMES), examined one of the affected Descote valves to determine possible causes of the cracking. Its investigation found that the failure mode of the packing nut was intergranular cracking. The metallographic structure of the examined nut was different from Descote and Superior nuts produced from other bar stock.

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The cracked packing nuts were produced from material designated heat lot R91. The MMES investigation also indicated that the nut had significant residual stresses, possibly resulting from surface finishing operations. These findings suggest that the packing nuts produced from heat lot R91 and/or subjected to surface grinding are susceptible to stress corrosion cracking.

Descote has also investigated the cracking problem and concluded that the cracking is the combined result of the following:

1. Excessive stresses placed on the nut by cold flow and thermal expansion of the teflon packing rings, resulting from retightening of the nut and repeated heating of the valve;
2. Mechanical and structural characteristics of the packing nut material are incompatible with these stresses; and
3. The presence of uranium hexafluoride, hydrofluoric acid, and nascent hydrogen facilitates cracking.

Based on its findings and those of MMES, Descote has recalled all one-inch valve packing nuts produced from heat lot R91.

#### Discussion:

The American National Standards Institute (ANSI) provides criteria for packaging of uranium hexafluoride for transport. The criteria are found in ANSI N14.1-1987, "Uranium Hexafluoride-Packaging for Transport." This standard provides, in part, specific information on design, fabrication, and assembly requirements for the one-inch valve installed in uranium hexafluoride cylinders.

The standard states that the valve packing nut is initially to be torqued in the range of 120 to 150 foot-pounds, to compact the teflon packing rings. If leakage at the valve stem occurs, the packing nut may be retightened. However, excessive force is not to be used in an attempt to eliminate the leak. The maximum torque permitted by the standard for retightening the packing nut is 150 foot-pounds.

Although NRC does not consider the cracked packing nut to be a major safety issue, licensees should consider actions to identify and reduce the occurrence of cracking. Licensees should review their retightening procedures to ensure that operators are not misapplying the ANSI torquing requirement by retightening packing nuts to the maximum torque with each valve use. Furthermore, since packing nuts are more likely to crack while in service, licensees should have operators check for cracked packing nuts before and after each valve use.

No written response is required by this information notice. If you have any questions about this matter, please direct them to the technical contacts listed below or to the appropriate NRC regional office.

*Glenn L. Spolow*  
Richard E. Cunningham, Director  
Division of Industrial and  
Medical Nuclear Safety *for.*

Technical Contacts: W. Scott Pennington, NMSS  
(301) 492-0693

George H. Bidinger, NMSS  
(301) 492-0683

Attachments:

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

LIST OF RECENTLY ISSUED  
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
89-60	Maintenance of Teletherapy Units	08/18/89	All U.S. NRC Medical Teletherapy Licensees.
89-47	Potential Problems With Worn or Distorted Hose Clamps on Self-Contained Breathing Apparatus	06/18/89	All holders of operating licenses or construction permits for nuclear power reactors and fuel facilities.
89-46	Confidentiality of Exercise Scenarios	06/11/89	All holders of licenses for fuel cycle facilities and byproduct material licensees having an approved emergency response plan.
89-37	Proposed Amendments to 40 CFR Part 61, Air Emission Standards for Radionuclides	04/04/89	All U.S. NRC licensees.
89-36	Loss and Theft of Unsecured Licensed Material	03/30/89	All U.S. NRC byproduct, source and special nuclear material licensees
89-34	Disposal of Americium Well-Logging Sources	03/30/89	All holders of U.S. NRC specific licenses authorizing well-logging activities.
89-25	Unauthorized Transfer of Ownership or Control of Licensed Activities	03/07/89	All NRC source, byproduct, and special nuclear material licensees.
89-24	Nuclear Criticality Safety	03/06/89	All fuel cycle licensees and other licensees possessing more than critical mass quantities of special nuclear material

LIST OF RECENTLY ISSUED  
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
89-77	Debris in Containment Emergency Sumps and Incorrect Screen Configurations	11/21/89	All holders of OLS or CPs for PWRs.
89-76	Biofouling Agent: Zebra Mussel	11/21/89	All holders of OLS or CPs for nuclear power reactors.
89-75	Falsification of Welder Qualifications for Contractor Employees	11/20/89	All holders of OLS or CPs for nuclear power reactors.
89-74	Clarification of Transportation Requirements Applicable to Return of Spent Radiopharmacy Dosages from Users to Suppliers	11/7/89	All manufacturers and distributors of radiopharmaceuticals for medical use, nuclear pharmacies, and medical licensees.
89-73	Potential Overpressurization of Low Pressure Systems	11/1/89	All holders of OLS or CPs for nuclear power reactors.
89-72	Failure of Licensed Senior Operators to Classify Emergency Events Properly	10/24/89	All holders of OLS or CPs for nuclear power reactors.
89-71	Diversion of the Residual Heat Removal Pump Seal Cooling Water Flow During Recirculation Operation Following a Loss-of-Coolant Accident	10/19/89	All holders of OLS or CPs for nuclear power reactors.
89-70	Possible Indications of Misrepresented Vendor Products	10/11/89	All holders of OLS or CPs for nuclear power reactors.
89-69	Loss of Thermal Margin Caused by Channel Box Bow	9/29/89	All holders of OLS or CPs for BWRs.

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NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555

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NOVEMBER , 1989

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Editor *EK*  
EKraus: 11/9/89

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