UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
WASHINGTON, D.C. 20555-0001

July 30, 1997

NRC INFORMATION NOTICE 97-57: LEAK TESTING OF PACKAGING USED IN THE TRANSPORT OF RADIOACTIVE MATERIAL

Addressees

Suppliers and users of packaging for the transportation of radioactive material required to perform packaging leak tests.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to observed shortcomings in leak testing of packaging used in the transport of radioactive material. It is expected that recipients will review the information for applicability to their operations and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

As part of the fabrication, operation, and maintenance of transportation packaging, leak testing may be used to verify the integrity of a packaging's containment. NRC, through its transportation inspection program, has noted shortcomings in the performance of packaging leak tests. Specifically, NRC has found that purging, used to remove packaging cavity air and establish a known representative tracer mixture at the containment boundary being tested, has been performed inadequately and that gas used in tests has not been controlled to ensure its quality (e.g., tracer gas concentration). These findings introduce uncertainties that could lead to the acceptance of erroneous test results.

Discussion

To obtain accurate leak test data, measures must be taken to ensure that a known representative tracer mixture reaches the containment boundary being tested. However, NRC has found that leak tests have been performed without using the appropriate level of control. American National Standard Institute (ANSI) N14.5-1987, "Leakage Tests on Packages for Shipment of Radioactive Materials," Appendix A, Section A2.2, states: "Tracer materials are to be clean and free of contaminants that might affect test results. Care must be taken to ensure that a known representative tracer mixture reaches the boundary being tested." It should be noted that NRC finds ANSI N14.5 generally acceptable, as described in NRC Regulatory Guide 7.4, "Leakage Tests on Packages for Shipment of Radioactive Materials."

NRC inspections have identified two factors that may not allow a known representative tracer mixture to exist at the boundary being tested; (1) incomplete purging of the packaging cavity, and (2) lack of objective evidence documenting critical characteristics of gas used in testing (e.g., tracer gas concentration). Each factor is described in further detail below.

(1) Packaging design and configuration during testing have been identified as contributing factors to incomplete packaging purging. NRC has observed purging operations and identified the following inappropriate coincident conditions: (a) adjacent vent and drain ports located at same end of the packaging, (b) small packaging diameter-to-length ratio, (c) absence of an internal purge path, and (d) port orientation incompatible with tracer gas characteristics (i.e., specific gravity). It was not evident to NRC that the purge operations observed during leak tests would produce a known concentration of tracer gas or a uniform gas mixture throughout the packaging cavity. Evaluation of the effects of packaging design and configuration on purge operations can be used to improve purge results. Other methods of establishing a known representative tracer mixture, such as evacuation and fill, have been found to be effective.

(2) In order to ensure that a known representative tracer mixture exists at the boundary being tested, objective evidence about critical characteristics of the tracer gas must be known before the gas is introduced into the packaging cavity for testing. The required level of objective evidence depends on a material's safety-related application. In the case of leak testing, tracer gas is used to verify the integrity of a packaging's containment, which is typically classified as "critical to safe operations." NUREG/CR-6407, "Classification of Transportation Packaging and Dry Spent Fuel Storage System Components According to Importance to Safety," provides guidance on component classification and required quality assurance records. NUREG/CR-6407 also addresses quality assurance records for the dedication of safety-related commercial-grade items, such as a tracer gas.

Further guidance on procurement of commercial-grade items for safety-related applications can be found in NRC Generic Letter 89-02, "Actions to Improve the Detection of Counterfeit and Fraudulently Marked Products." This generic letter conditionally endorses the guidelines contained in Electric Power Research Institute Group NP-5652, "Guidance for the Utilization of Commercial-Grade Items in Nuclear Safety-Related Applications (NCIG-07)." The guidance provides examples of commercial-grade items (e.g., fuel oil, lubricating grease/oil, materials, etc.) and potential critical characteristics in terms of product identification (e.g., color coding, industry standard markings, part number/unique identifier, etc.) and physical characteristics (e.g., concentration, purity, etc.). The guidance further provides four acceptance methods: (a) special tests and inspections, (b) commercial grade survey of supplier, (c) source verification, and (d) acceptable supplier/item performance record.

It should be noted that industry practice such as in American Society for Testing and Materials, Designation E 1212-92, "Standard Practice for Quality Control Systems for Nondestructive Testing Agencies," requires that the quality control system include

procedures to assure effective supplier quality for all purchased materials and that requirements for quality shall be established in the purchase agreement. It further requires that quality records include product identification to allow traceability of what was tested and what materials and equipment were used.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below.

for William F. Kane, Director
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Office of Nuclear Material
Safety and Safeguards

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Attachments:
1. Referenced Codes and Standards
2. List of Recently Issued NMSS Information Notices
3. List of Recently Issued NRC Information Notices

Attachments filed in Docket

LIST OF RECENTLY ISSUED NMSS INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
97-56	Possession Limits for Special Nuclear Material at the Environcare of Utah Low-Level Radioactive Waste Disposal Facility	07/28/97	All licensees authorized to possess special nuclear material
97-55	Calculation of Surface Activity for Contaminated Equipment and Materials	07/23/97	All Uranium Recovery Licensees
97-51	Problems Experienced with Loading and Unloading Spent Nuclear Fuel Storage and Transportation Casks	07/11/97	All holders of OLs or CPs for nuclear power reactors Designers and fabricators of independent spent fuel storage installations All holders of or applicants for licenses to operate ISFSIs
97-50	Contaminated Lead Products	07/10/97	All U.S. Nuclear Regulatory Commission licensees
97-47	Inadequate Puncture Tests for Type B Packages Under 10 CFR 71.73(c)(3)	06/27/97	All "users and fabricators" of type B transportation packages [as defined in 10 CFR 171.16(10(B)]

REFERENCES

1. American National Standard Institute N14.5-1987, "Leakage Tests on Packages for Shipment of Radioactive Materials."

2. American Society for Testing and Materials, Designation E 1212-92, "Standard Practice for Quality Control Systems for Nondestructive Testing Agencies."

3. Electric Power Research Institute Group NP-5652, "Guidance for the Utilization of Commercial-Grade Items in Nuclear Safety-Related Applications (NCIG-07)."

4. NUREG/CR-6407, "Classification of Transportation Packaging and Dry Spent Fuel Storage System Components According to Importance to Safety."

5. Regulatory Guide 7.4, "Leakage Tests on Packages for Shipment of Radioactive Material."

6. U.S. Code of Federal Regulations, 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."

7. U.S. Nuclear Regulatory Commission, Generic Letter 89-02, "Actions to Improve the Detection of Counterfeit and Fraudulently Marked Products."

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97-55	Calculation of Surface Activity for Contaminated Equipment and Materials	07/23/97	All Uranium Recovery Licensees
97-54	NRC Licensed Operators at Six Non-Power Reactor Facilities Allow their Operator Licenses to Expire	07/18/97	All holders of OLs or CPs for test and research reactors and all licensed operators at test and research reactor facilities
97-53	Circuit Breakers Left Racked Out in Non-Seismically Qualified Positions	07/18/97	All holders of OLs or CPs for nuclear power reactors
97-52	Inadvertent Loss of Capability for Emergency Core Cooling System Motors	07/17/97	All holders of OLs or CPs for nuclear power reactors

OL = Operating License
CP = Construction Permit

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NUCLEAR REGULATORY COMMISSION
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