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

March 28, 2016

NRC INFORMATION NOTICE 2016-04: ANSI N14.5-2014 REVISION AND LEAKAGE RATE TESTING CONSIDERATIONS

ADDRESSEES

All registered users of a Type B transportation package under Title 10, "Energy," of the *Code of Federal Regulations* (10 CFR) Part 71, "Packaging and Transportation of Radioactive Material."

All holders of or applicants for a Type B transportation package certificate of compliance (CoC) under 10 CFR Part 71.

All holders of or applicants for: (1) a spent fuel storage cask CoC under 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste," and (2) a general or site-specific independent spent fuel storage installation (ISFSI) license under 10 CFR Part 72.

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to inform addressees of: (1) the 2014 revision to the American National Standards Institute (ANSI) N14.5, "American National Standard for Radioactive Materials—Leakage Tests on Packages for Shipment," (ANSI N14.5-2014), and (2) specific leakage rate testing considerations.

The NRC expects that recipients will review the information for applicability to their facilities and consider actions, as appropriate. However, suggestions contained in this IN are not NRC requirements; therefore, no specific action or written response is required.

DESCRIPTION OF CIRCUMSTANCES

The NRC participated in the revision of the recently published ANSI N14.5-2014, the current consensus standard that supersedes the 1997 revision of ANSI N14.5. Addressees currently reference and use the 1997 revision of ANSI N14.5 to meet 10 CFR Parts 71 and 72 containment and confinement regulations, respectively. The NRC is in the process of updating Regulatory Guide (RG) 7.4, "Leakage Tests on Packages for Shipment of Radioactive Material," to reflect this revision (RG 7.4 currently endorses the 1997 revision of ANSI N14.5), but this IN informs addressees of the recently published ANSI N14.5-2014 in a timely manner.

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BACKGROUND

Applicable requirements and industry guidance include:

1. American National Standards Institute (ANSI) N14.5-2014, "American National Standard for Radioactive Materials - Leakage Tests on Packages for Shipment."
2. American Society for Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A, "Personnel Qualification and Certification in Nondestructive Testing."
3. ANSI/ASNT CP-189, "American National Standard ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel."
4. Regulatory Guide 7.4, "Leakage Tests on Packages for Shipment of Radioactive Material."
5. U.S. Code of Regulations, 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."
6. U.S. Code of Regulations, 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste."

DISCUSSION

The NRC encourages addressees that had been using the 1997 revision of ANSI N14.5 to become familiar with ANSI N14.5-2014, the current consensus standard that supersedes the 1997 revision of ANSI N14.5. The revised standard and appendices have new information and clarifications. In addition, there are leakage rate testing considerations that the NRC believes addressees would benefit from knowing, based on the new information in ANSI N14.5-2014 and the history of NRC staff's review of transportation packages and storage casks. These considerations are discussed below. Although the considerations presented do not detail specific industry events, they do highlight important concepts for addressees to know, as well as section(s) of ANSI N14.5-2014 or other industry standards where additional information can be found.

Pre-shipment leakage rate test on Type B package containment boundary components that have been opened: Section 7.6 and Table 1 of ANSI N14.5-2014 address the pre-shipment leakage rate test on Type B package containment boundary components that have been opened. The pre-shipment leakage rate test is necessary to confirm that the containment system is properly assembled for each shipment. Type B packages containing a Type B quantity of material could have been used to transport Type A, Low Specific Activity (LSA) material, or Surface Contaminated Objects (SCO) in a previous shipment. Containment boundary components (e.g., seals and valves) could have been opened during a previous shipment of Type A contents, LSA material, or SCO, but a pre-shipment leakage rate test might not have been performed at that time. A pre-shipment leakage rate test should be performed on the containment boundary components that cannot be verified as being closed to confirm that the containment system is properly assembled on packages containing a Type B quantity of material.

Pre-shipment leakage rate test acceptance criterion: Section 7.6.4 of ANSI N14.5-2014 provides the pre-shipment leakage rate test acceptance criterion that shall be either: (1) a leakage rate of not more than the reference air leakage rate, L_R, or (2) no detected leakage when tested to a

sensitivity of at least 1×10^{-3} reference cubic centimeter per second (ref-cm^3/s). The pre-shipment leakage rate test is necessary to confirm that the containment system is properly assembled for each shipment. The example in Section B.15.22 of ANSI N14.5-2014 presents a scenario where the containment criterion is 1×10^{-7} ref-cm^3/s and the pre-shipment leakage rate test shows a leakage rate that is less than 1×10^{-3} ref-cm^3/s. The last paragraph of the example notes that the pre-shipment leakage rate test procedure sensitivity is not intended to relax the containment criterion; in addition, the example illustrates that the pre-shipment leakage rate verification is not satisfied even though the leakage is less than 1×10^{-3} ref-cm^3/s.

Qualification and certification of personnel performing leakage rate tests: Sections 8.5 and 8.8 of ANSI N14.5-2014 address that leakage rate testing shall be performed by personnel who are qualified and certified in accordance with the requirements of the American Society for Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A.

Qualification and certification of personnel approving leakage rate testing procedures: Sections 8.5 and 8.8 of ANSI N14.5-2014 address that leakage rate testing procedures shall be approved by personnel whose qualification and certification in the nondestructive method of leak testing includes certification by a nationally recognized society at a level appropriate to the writing and/or review of leakage rate testing procedures. For example, an individual who has obtained certification as an ASNT nondestructive testing (NDT) Level III in leak testing has the qualification necessary to develop and approve written instruction for conducting leakage rate testing as well as the knowledge to consider practical leakage rate testing issues (e.g., isolation of a vacuum pump, the reliability of boundary components). Additional information can be found in ANSI/ASNT CP-189.

Leakage rate testing procedure qualification: Sections 8.6 and A.3.8 of ANSI N14.5-2014 address leakage rate testing procedure qualification; this is necessary to ensure meaningful leakage rate test results. Section 2.1 of ANSI N14.5-2014 also includes new definitions related to calibration and procedure qualification. For example, an individual who has obtained certification as an ASNT NDT Level III in leak testing has the knowledge to ensure a leakage rate testing procedure is qualified.

Wetting of the test item: Section A.3.5 of ANSI N14.5-2014 addresses that the test item, which includes the seal interspace, should be dried thoroughly before the leakage rate test when prior wetting of the test item cannot be avoided.

Pressure change leakage rate test method sensitivity to temperature variations: Sections A.5.1 and A.5.2 of ANSI N14.5-2014 note that small temperature variations can lead to high pressure variations in the gas pressure drop and gas pressure rise leakage rate test methods, and therefore, temperature variations should be avoided.

Detector probe leakage rate test method and test item consideration: Section A.5.8 of ANSI N14.5-2014 addresses the importance of the detector probe travel speed and the necessary proximity (standoff distance) of the detector probe to the test item. These two factors are also important when using a thermal conductivity leak detector. Sections 7.1.1 and 7.1.2 of ANSI N14.5-2014 also address design considerations for leakage rate testing and leakage rate test method selection, respectively.

Elastomeric O-ring permeation: Section B.11 of ANSI N14.5-2014 addresses permeation, the passage of fluid (e.g. leak test tracer gas) through a solid barrier. Consideration of permeation

should be given when selecting a leakage rate test tracer gas in combination with an elastomeric O-ring material.

CONCLUSION

In summary, addressees should familiarize themselves with ANSI N14.5-2014 to become aware of new information and clarifications within the current consensus standard and appendices. In addition, it is recommended that addressees specifically take into account the leakage rate testing considerations identified above.

CONTACTS

This information notice requires no specific action or written response. Please direct any questions about this matter to the technical contact listed below or to the appropriate Office of Nuclear Material Safety and Safeguards (NMSS) project manager.

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