



# ANSI N14.5-2014 Revision and Leakage Rate Testing Considerations



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# Presentation Overview

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# Introduction

- ANSI N14.5, “American National Standard for Radioactive Materials - Leakage Tests on Packages for Shipment”
- Used to meet 10 Code of Federal Regulations (CFR) Parts 71 and 72 containment and confinement regulations, respectively
- Regulatory Guide 7.4 endorses the methods and procedures in ANSI N14.5-1997 and reaffirmed in 2008

# Introduction

- ANSI N14.5 standard describes:
  - Methods for converting regulatory requirements to allowable leakage rates
  - Requirements for the design, fabrication, maintenance, periodic, pre-shipment leakage rate tests (Section 7 and Table 1)
- Three informative appendices:
  - Leakage test methods and procedures
  - Basic data and worked examples
  - Releasable homogenous mixture relationships

# ANSI N14.5-2014

- ANSI N14.5-2014 is the recently published current consensus standard with appendices that supersedes the 1997 edition; includes new information and clarifications
  - Section numbers within this presentation are from ANSI N14.5-2014
- Who should read ANSI N14.5-2014?
  - 10 CFR Part 71 registered users, Certificate of Compliance (CoC) holders or applicants for Type B packages
  - 10 CFR Part 72 holders or applicants for: (1) a cask CoC, (2) a general or site-specific independent spent fuel storage installation (ISFSI) license

## **Pre-shipment leakage rate test on containment boundary components that have been opened: Section 7.6 and Table 1**

- 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 Object (SCO) in a previous shipment
- However, containment boundary components could have been opened during a prior shipment of Type A, 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 containment boundary components which cannot be verified as being closed on packages containing a Type B quantity of material

## **Pre-shipment leakage rate acceptance criterion: Section 7.6.4**

- Provides the pre-shipment leakage rate test acceptance criterion which 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  $1 \times 10^{-3}$  ref-cm<sup>3</sup>/s
- Example in Section B.15.22 presents a scenario where the pre-shipment leakage rate test is not satisfied even though the leakage is less than  $1 \times 10^{-3}$  ref-cm<sup>3</sup>/s

## Qualification and certification of personnel:

Sections 8.5 and 8.8

- **Approving leakage rate testing procedures**
  - 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



## **Qualification and certification of personnel (continued): Sections 8.5 and 8.8**

- **Performing leakage rate tests**
  - Testing shall be performed by personnel qualified and certified in accordance with American Society for Nondestructive Testing (ASNT) SNT-TC-1A
- ASNT SNT-TC-1A is Personnel Qualification and Certification in Nondestructive Testing (NDT)
- ANSI/ASNT CP-189 is Standard for Qualification and Certification of Nondestructive Testing Personnel
- Qualification and certification of personnel helps to ensure reliable leakage rate testing

## **Leakage rate testing procedure qualification: Sections 8.6 and A.3.8**

- Necessary to ensure meaningful leakage rate test results
- Section 2.1 has been revised to include new definitions related to calibration and procedure qualification
- 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**

- The test item, which includes the seal interspace, should be dried thoroughly before the leakage rate test

## **Pressure change leakage rate test method sensitivity to temperature variations: Sections A.5.1 and A.5.2**

- 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**

- The importance of the detector probe travel speed and proximity or standoff distance to the test item
  - These two factors also apply to a thermal conductivity leak detector
- Sections 7.1.1 and 7.1.2 address design considerations for leakage rate testing and leakage rate test method selection, respectively

## **Elastomeric O-ring permeation:**

### Section B.11

- Permeation is the passage of fluid (e.g. leak test tracer gas) through a solid barrier; this can be a difficulty during leakage rate testing
- Consideration of permeation should be given when selecting a leakage rate test tracer gas in combination with an elastomeric O-ring material

# Summary

- Reading ANSI N14.5-2014 will help users to become aware of the new information and clarifications within the current consensus standard and appendices
  - Available for purchase at ANSI eStandards Store, [www.webstore.ansi.org](http://www.webstore.ansi.org)
- Consideration of the described leakage rate testing issues will help users ensure leakage rate testing is effective and reliable

# References

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) SNT-TC-1A, “Personnel Qualification and Certification in Nondestructive Testing.”
3. ANSI/ASNT CP-189, “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 Federal Regulations, 10 CFR Part 71, “Packaging and Transportation of Radioactive Material.”
6. U.S. Code of Federal 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.”

# Acronyms

ANSI: American National Standards Institute

ASNT: American Society for Nondestructive Testing

CFR: Code of Federal Regulations

CoC: Certificate of Compliance

ISFSI: Independent spent fuel storage installation

LSA: Low specific activity

NDT: Nondestructive testing

SCO: Surface contaminated objects