Canadian Nuclear Safety Commission
Regulatory Expectations for Leak Testing of Sealed Sources

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1. Introduction

Leak testing of sealed sources is required under CNSC regulations to ensure that a sealed source has not developed defects, has been damaged or has degraded so as to present an unrecognized radiological risk to persons using or working near the source.

This document outlines the CNSC's expectations for applicants and licensees to meet the regulatory requirements for leak testing of sealed sources.

Nothing in this document should be construed to imply that the CNSC authorizes, certifies or licences persons to leak test sealed sources. It is the responsibility of the licensee to ensure that any person conducting a leak test of a sealed source on their behalf can do so in accordance with these expectations.

2. Regulatory Basis

The regulatory requirement to conduct regular leak testing of sealed sources, including their frequency and detection level, is specified in section 18 of the *Nuclear Substances and Radiation Devices Regulations* and in section 19 of the *Class II Nuclear Facilities and Prescribed Equipment Regulations*:

(1) Every licensee who possesses, uses or produces either a sealed source containing 50 MBq or more of a nuclear substance or a nuclear substance as shielding shall, at the following times, conduct leak tests on the sealed source or shielding using instruments and procedures that enable the licensee to detect a leakage of 200 Bq or less of the nuclear substance:
(a) where the sealed source or shielding is used after being stored for 12 or more consecutive months, immediately before using it;
(b) where the sealed source or shielding is being stored, every 24 months;
(c) where an event that may have damaged the sealed source or shielding has occurred, immediately after the event; and
(d) in all other cases,
(i) where the sealed source or shielding is located in a radiation device, every 12 months, and
(ii) where the sealed source or shielding is not located in a radiation device, every six months.

(2) Subsection (1) does not apply in respect of a sealed source that is
(a) gaseous;
(b) contained in a static eliminator that has been retained by the licensee for less than 15 months;
(c) exempted under section 5, 6, 8 or 8.1; or
(d) used or stored underwater in a nuclear facility that is equipped with a device capable of detecting waterborne contamination of 200 Bq or less of a nuclear substance.

(3) Where a licensee, in the course of conducting a leak test on a sealed source or on shielding, detects the leakage of 200 Bq or more of a nuclear substance, the licensee shall
(a) discontinue using the sealed source or shielding;
(b) discontinue using the radiation device in which the sealed source or shielding is located or may have been located;

(c) take measures to limit the spread of radioactive contamination from the sealed source or shielding; and
(d) immediately after complying with paragraphs (a) to (c), notify the Commission that the leakage has been detected.

3. Program Requirements for Leak Testing

In order to ensure that the leak testing requirements of the Regulations are met, applicants and licensees must verify that the leak testing is carried out in accordance with the following expectations.

3.1. Wipe Sampling Procedure Documentation

Before wiping any sealed source the licensee shall have available for inspection, a documented sampling procedure consisting of:
(a) a general description of the method of wipe sampling;
(b) a list of all sealed sources to be leak tested, and their locations;
(c) a step by step procedure of the method for wipe sampling each type of sealed source and each type of sealed source containment including:
- (i) operating instructions for sealed source drives, shutter interlocks and safety features during sampling,
- (ii) a description and reason for choice of physical configuration of the wipe, material of the wipe, and compatible solvent (if required),
- (ill) a description of the method of wiping, and
- (iv) a description of the location of wiping, which depending upon sealed source activity and sealed source accessibility may be from the exterior surface of the sealed source or the immediate environment of the sealed source device or holder; and,

(d) a description of the types of wipe sample containers including:
- (i) means of identifying the wipe sample or container or both, and
- (ii) the method of packaging and transporting to the person who will be conducting the measurement of the swipe.

3.2. Expectations for Sampling

Sampling must be performed by a person who:
- (a) understands regulatory requirements and these expectations;
- (b) knows the type and activity of the sealed source and the sealed source containment;
- (c) can recognize and minimize the potential contamination and radiation hazards associated with:
  - (i) the sealed source and its containment, including any sealed source windows,
  - (ii) wipe sampling the sealed source or its immediate environment, and
  - (iii) the wipe sample;
- (d) has available and follows the procedure detailed in section 3.1;
- (e) has available sufficient wipe sampling materials and wipe sample containers;
- (f) follows all manufacturers instructions for the safe operation of any radiation device for the purposes of leak testing; and,

(g) follows all radiation and other safety precautions for working in the area in which the sealed source is located, including lock-out and personal protection requirements.

3.3. Sampling Records

Immediately following sealed source wipe sampling, the person conducting the sampling shall place the wipe sample in an identified container, recording the:

(a) name of the person conducting the sampling;
(b) licensee name and CNSC licence number;
(c) sealed source identification information (make, model, serial number and isotope);
(d) sample container identification number; and,
(e) date that the sample was taken.

All of the information in this record should be transferred with the sample container to the person who will be conducting the analysis of the swipe.

3.4. Measuring Procedure Documentation

Before measuring any sealed source leak test wipe samples, the person conducting the analysis of the swipe shall have available a documented sample measuring procedure consisting of:

(a) a general description of the method of measuring; and,
(b) a step by step procedure for measuring wipe samples with the measuring equipment including:
    (i) a description and identification of measuring equipment (make, model and serial number),
    (ii) instructions, preferably including manufacturers' manuals, to set up, operate and measure samples, and,
    (iii) a description of the tests to be performed using check sources to demonstrate the capability to make reproducible measurements, and to detect 200 Bq or less of each isotope of interest.

3.5. Sample Analysis

Analysis of the swipe sample must be performed by a person who:

(a) knows the regulatory requirements and the expectations outlined in this document;
(b) is familiar with the operation of the measuring equipment;
(c) can recognize and minimize the potential radiation and contamination hazards associated with the wipe sample; and,
(d) has available and follows the procedure detailed in section 3.4.

3.6. Leak Test Record Completion

Immediately following the wipe sample measurement, the person conducting the analysis of the swipe sample shall complete the leak test record, retain a copy and send the

original to the licensee. The person who analyzed the swipe sample shall immediately advise the licensee if a sealed source wipe sample has contamination which exceeds the leakage criterion of 200 Bq.

Licensees must notify the CNSC of any sealed source where leakage has been detected in excess of 200 Bq.

4. Maintenance of Records

The licensee shall retain records of all leak testing as required by the NSC Act and Regulations and shall retain those records for the period specified in the licence or the Regulations, as appropriate.