REGULATORY GUIDE

Wipe testing of sealed sources & use of sealed sources beyond recommended working life

REGULATORY SERVICES
REG-COM-SUP-270A v7.1
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1. Scope of this regulatory guide

This regulatory guide applies to sealed sources that are in use and does not apply to sealed sources identified in the Licence Holder’s Source Inventory Workbook as a ‘sealed source that is in storage and awaiting disposal’. Guidance on the safe storage of sealed sources awaiting disposal can be found in Radiation Protection Series No.16 Predisposal Management of Radioactive Waste, and in Australian and New Zealand Standard AS/NZS 2243.4:2018 Safety in laboratories – Part 4 Ionizing radiations (AS/NZS 2243.4).

The term ‘sealed source’ refers to a radioactive source in which the radioactive material is permanently sealed in a capsule, or closely bonded and in a solid form.

2. Wipe testing of sealed sources

Sealed sources should be tested at regular intervals to ensure that they have not developed a leak. Guidance on the conduct of recurrent testing of sealed sources is provided by standards such as ISO9978:1992 Radiation protection – Sealed radioactive sources – Leakage test methods (ISO9978) and AS/NZS2243.4 or relevant codes of practice such as ARPANSA Radiation Protection Series No.13 Safe Use of Fixed Radiation Gauges (RPS13).

Different leakage test methods are specified in ISO9978 including wipe (or smear), immersion, bubble or helium leakage test methods. A wipe test is recommended in circumstances where a suitable laboratory or the source manufacturer is not available to perform a leakage test according to one of the immersion, bubble or helium methods.

AS/NZS2243.4 specifies that each sealed source or its housing shall be examined for contamination and integrity on an annual basis. Wipe or smear testing are provided as an example of how this can be achieved. AS/NZS2243.4 recommends that leak testing should be performed at 10 yearly intervals and whenever leakage is suspected (citing ISO9978).

The following table outlines the frequency of wipe testing of sealed sources:

<table>
<thead>
<tr>
<th>Applied as a Condition of Licence</th>
<th>Wipe or smear test must be performed:</th>
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<tr>
<td>AS2243.4 Relevant code of practice</td>
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<tr>
<td>× ×</td>
<td>Annually</td>
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<td>At the regular interval specified in the code of practice, or annually, if not specified in the code of practice</td>
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1 ARPANSA Radiation Protection Series C-1 Radiation Protection in Planned Exposure Situations
All results of wipe tests must be recorded and retained with the source records. If a wipe test reveals contamination levels on a sealed source in excess of 200 Bq, the sealed source is not considered to be leak tight and must be withdrawn from use.

If contamination is detected on a sealed source, but at a level that does not exceed 200 Bq, then action should be taken to establish whether this arises from sealed source leakage. This could be achieved by repeating the tests more frequently (e.g. every six months) to determine whether the level of radioactivity is increasing.

Where access to the sealed source is neither possible nor desirable because of the unjustified exposure of personnel, a wipe or smear test may be carried out on the nearest accessible surface to the sealed source. Under these circumstances, if contamination is detected in excess of 20 Bq, the sealed source is not considered to be leak tight and must be immediately withdrawn from use and the nature and extent of the contamination must be investigated.

ARPANSA notes that Australian laboratories capable of performing the immersion, bubble or helium test methods are not currently providing such services. Until further notice, if a 10 yearly leak test is required on a sealed source (as recommended by AS/NZS2243.4) then a wipe method may be used.

### 3. Use of sealed sources beyond their recommended working life

The concept of ‘recommended working life’ was introduced by Amersham (Radiochemical Centre Ltd) in 1977 to draw the user’s attention to the fact that, like any manufactured article, a sealed source has a finite life. The recommended working life was intended as a guide to create an awareness of the need for regular inspection and reasonable judgements to be made about the continued suitability of a sealed source for a particular application.

For sources that have exceeded their recommended working life, the frequency of testing needs to be increased to more closely monitor the integrity of the source capsule and its housing.

Where a recommended working life has not been assigned by the sealed source manufacturer, ARPANSA has determined that a recommended working life of:

- 15 years be assigned to the following sealed sources: Cs-137, Co-60, Ba-133, Am-241, Am-241/Be, Ra-226, Th-232, Sr-90 (industrial)
- 10 years be assigned to the following sealed sources: Ni-63, Sr-90 (medical and veterinary)
- 5 years be assigned to all other sealed sources, unless the user can demonstrate to the satisfaction of the CEO of ARPANSA that it should be longer

ARPANSA will allow the continued use of a sealed source in the Group 1 (low hazard category) beyond its recommended working life – up to a period of one additional working life – without the need for prior approval, subject to the following conditions:

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3 The specified level of contamination (20 Bq) has been derived on the assumption that there will likely be a loss during transfer of radioactivity from a leaking sealed source to the nearest accessible surface. ARPANSA is aware that this value is consistent with NSW Environment Protection Authority Radiation Guideline 3 – Recommendations for minimum standards and safety requirements for fixed radiation gauges (sealed source devices)
4 E A Lorch. The concept of recommended working life applied to radiation sources. Radiological Protection Bulletin No 34, May 1980
5 As defined in section 4 of the Australian Radiation Protection and Nuclear Safety Regulations 2018
1. The sealed source, or nearest accessible part to the sealed source, must be wipe or smear tested at 12 month intervals; and

2. All results of wipe or smear tests must be recorded and retained with the source records.

In addition to Group 1 sources, ARPANSA will allow the continued use of the following types of Group 2 sealed sources (medium hazard category) beyond the recommended working life - up to a period of one additional working life without the need for prior approval:

- Portable density/moisture gauges containing sealed sources
- Fixed radiation gauges containing sealed sources

This extension of recommended working life is subject to the following conditions:

1. For portable density/moisture gauges containing sealed sources - the source, or its housing at a point of closest approach to the source, must be wipe or smear tested at 6 monthly intervals in accordance with Annex F of RPS13. (Note that the relevant code of practice for portable density/moisture gauges, RPS5\(^6\) does not provide specific guidance on this matter.)

2. For fixed radiation gauges - the sealed source, or its housing, at or immediately adjacent to the gauge shutter or source control mechanism, must be wipe or smear tested at 12 monthly intervals in accordance with Annex F of RPS13.

3. For both types of gauge, all results of wipe or smear tests must be recorded and retained with the source records.

Continued use of other higher hazard sealed sources in Group 2 or 3 beyond one recommended working life or any source beyond a second recommended working life (whether Group 1, 2 or 3) will be considered on a case-by-case basis, taking into account:

- Activity of the source
- Toxicity of the radionuclide and its half life
- Source construction
- Type of dealing
- Environment in which the source has been/will be used
- Details on source use
- Any other inspections or examinations that have been performed (e.g. 6 monthly or annual wipe tests)

A written submission should be made to ARPANSA for such cases.

Any sealed sources that have exceeded their recommended working life must be clearly identified as such in the Source Inventory Workbook.

\(^6\) ARPANS Radiation Protection Series No. 5 Portable Density/Moisture Gauges Containing Radioactive Sources