

Radiation Guideline 3
**Recommendations for
minimum standards and safety
requirements for fixed radiation
gauges (sealed source devices)**

This guideline was developed by the Hazardous Materials, Chemicals and Radiation Section of the Environment Protection Authority in consultation with the Radiation Advisory Council.

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Introduction

A radiation gauge is a sealed source device that contains a sealed radioactive source used for gauging or controlling a parameter, such as thickness, level or density in an industrial process. The term 'radiation gauge' includes the complete device, consisting of the sealed radioactive source, the source container or housing, the associated controller and the radiation detector. A radiation gauge becomes a fixed radiation gauge when it is permanently fixed in a position where it is to be used to carry out its gauging or control function.

Radioactive sources are used widely for gauging in industry and some of these can create significant hazards if not used safely. Consequently responsible persons must be licensed and must comply with any condition imposed on their licence.

This Guideline provides the responsible person, users and accredited consulting radiation experts (CRE) with information on the minimum standards and safety requirements relating to fixed radiation gauges that need to be met to comply with the Environment Protection Authority (EPA) requirements. This guideline should be read in conjunction with the *Radiation Control Act 1990* (the Act), the Radiation Control Regulation 2013 (the Regulation), and relevant conditions of licence and/or accreditation.

1. General requirements

1.1 User licence

Only persons licensed under s.7 of the Act can use (install and/or service) fixed radiation gauges.

1.2 Management licence

The responsible person must hold a valid radiation management licence issued under s.6 of the Act if they intend to own, store, sell or possess a radiation gauge/s and must comply with any conditions imposed on that licence and relevant requirements of the Act and Regulation. All regulated material owned by the licensee must be included on the licence.

1.3 Certification of fixed radiation gauges

The licensee must ensure that all fixed radiation gauges (FRGs) in their possession are tested and certified compliant by an appropriately accredited CRE:

- before it is used and
- then at intervals not exceeding two years from the date of the last certification.

1.4 Accreditation

Only persons accredited as a consulting radiation expert (fixed radiation gauges) under s.8 of the Act can assess fixed radiation gauges for the purpose of certifying compliance.

1.5 Further information on licensing

Information on user and management licences including fees can be found at www.epa.nsw.gov.au/radiation .

2. Quality assurance, installation and maintenance

2.1 Quality assurance

The responsible person must implement a quality assurance program for each fixed radiation gauge in their possession. The program must contain procedures and quality control tests which ensure compliance with this guideline. The quality assurance program must be fully documented and be available to the EPA on request. The program must include:

- (a) physical inspection (at least once every 12 months) to check the integrity of each gauge, to ensure that it is securely fixed in the correct operating position, and to check there is no physical damage which will jeopardise its safe use
- (b) measurement of radiation dose rates from the external surface of the gauge, at distances of 5 cm (<500 $\mu\text{Gy/h}$), and of 1 m (<10 $\mu\text{Gy/h}$), at least once every 12 months
- (c) wipe testing, in accordance with Appendix A of this guideline, to check for radioactive contamination, at intervals of 2 years
- (d) checking correct operation of shutter or source control mechanism, every 6 months
- (e) checking correct operation of radiation receptor (i.e. ionisation chamber or Geiger-Mueller tube), at least once every 6 months
- (f) calibration of radiation monitoring instruments used to measure radiation from the gauge surface in accordance with the EPA's Guideline 'Monitoring Devices', at intervals of 1 year.

2.2 Installation and maintenance

Installation of fixed radiation gauges and maintenance involving the gauge housings shall be carried out only by persons appropriately licensed under the Act.

2.3 Wipe tests of the surface of the gauge housing

A wipe test of the surface of the gauge housing shall be used as an indicator of leakage of radioactivity from the gauge source and shall be conducted at, or adjacent to, the gauge shutter or source control mechanism, in accordance with Appendix A of this guideline.

The responsible person shall obtain a wipe test report which must be retained for the purpose of licensing and is to be provided to the EPA for inspection when requested. Wipe test reports shall only be acceptable when issued by an accredited CRE who is responsible for ensuring that each wipe test is conducted properly and the radioactivity on each wipe medium is measured accurately.

The EPA shall be notified immediately if the radioactivity measured on the wipe medium (see Appendix A) is greater than 20 Bq. Repeat wipe tests shall then be conducted, at intervals to be specified by the EPA, in order to determine whether the activity detected by a wipe test increases with time.

If necessary, the EPA may require that a gauge be withdrawn from service immediately and that the source encapsulation be subjected to appropriate tests contained in ISO 9978:1992 *Radiation Protection - Sealed Radioactive Sources - Leakage Test Methods*.

2.4 Training

The responsible person shall ensure that employees who work in the vicinity of FRGs are properly instructed in any radiation hazards associated with their work and in any precautions necessary to limit radiation exposure of persons and to avoid radiation accidents.

2.5 Storage of radiation gauges not in use

When a fixed radiation gauge is not required for immediate use, or has been removed from service, the sealed radioactive source complete with the gauge housing shall be stored securely in a store which complies with the Australian Radiation Protection and Nuclear Safety Agency ARPANSA *Code of Practice and Safety Guide for the Safe Use of Fixed Radiation Gauges (RPS13)*.

2.6 Disposal of sealed sources from radiation gauges

A sealed radioactive source in a fixed radiation gauge shall not be used beyond the limit of its useful life as recommended by the source manufacturer, and in any event shall not normally be used for more than twelve years. If it is necessary for a sealed radioactive source in a fixed radiation gauge to be used for more than twelve years, this shall be allowed only with the agreement of the EPA which may require the source to be subjected to appropriate tests contained in ISO 9978:1992.

A CRE shall assume that a sealed radioactive source is more than twelve years old if it is not possible to verify its age because:

- the responsible person does not possess documentation which provides details of the source type, activity and encapsulation, verify the date of manufacture of the source, and confirm that the requisite associated tests were carried out by the source manufacturer or
- the source housing is not provided with a metal label giving details of the source and its encapsulation.

At the end of its useful life, the sealed radioactive source shall only be disposed of with the consent of the EPA. Wherever practicable the sealed source shall be returned to the source supplier/manufacturer. If this is not possible the source in its gauge housing shall be stored in an interim storage facility.

3. Safe use of radiation gauges

The following persons must comply with all relevant requirements of the, ARPANSA *Code of Practice and Safety Guide for the Safe Use of Fixed Radiation Gauges (RPS13)* except insofar as any such provision is inconsistent with the Act or the Regulation:

- the responsible person
- the licensed user and
- appropriately accredited CREs.

The Statutory Authority referred to in the Code of Practice is the:
Environment Protection Authority
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4. Clarification of the code of practice

Where reference is made in the ARPANSA *Code of Practice and Safety Guide for the Safe Use of Fixed Radiation Gauges (RPS 13)* to the requirements of the Statutory Authority, the EPA, the current requirements for the purposes of this document are provided below.

As stipulated in Section 3, responsible persons of fixed radiation gauges, accredited CREs (for fixed radiation gauges) and persons who are licensed to use or install/service fixed radiation gauges shall comply with all relevant provisions of the ARPANSA *Code of Practice and Safety Guide for the Safe Use of Fixed Radiation Gauges (RPS 13)*, except insofar as any such provision is inconsistent with the Act or the Regulation.

The following notes clarify certain provisions of the Code.

- Where the Code refers to 'responsible person' this shall be deemed to be the 'responsible person' in the terms of the Act.
- The Act and the Regulation form the relevant legislation in NSW.
- The dose limits for NSW are as set out in Schedule 5 of the Regulation.
- ISO 2919:1980, *Sealed Radioactive Sources – Classification* is an acceptable alternative standard.
- The source encapsulation or attached tag must be marked to indicate compliance with either ANSI N542.1977 or ISO 2919:1980.
- The standards for relevant testing of welded, brazed or fusion joints are the series of Australian Standards AS 2205.1 to AS2205.10, inclusive.
- The label shall bear the identification number of the radioactive source.
- Only persons licensed under the Act to service radioactive sources are approved to install gauges covered by this Code.
- Wipe tests shall be conducted every 2 years.
- The relevant radiation exposure limits referred to are those set out in Schedule 5 of the Regulation.
- The issue of personal monitoring devices to certain persons is mandatory under cl.29 of the Regulation. An employer must ensure that occupational exposed persons are provided with personal monitoring devices if:
 - servicing fixed radiation gauges and
 - undertaking neutron based detection, analysis and gauging (but only when used for bore-hole logging).
- The only acceptable calibration certificates for radiation survey meters are those issued by a laboratory having a national primary standard, or secondary or tertiary standard traceable to the national primary standard.
- Transportation of radiation gauges shall comply with cl.36 of the Regulation.

The appropriate contact for matters relating to the Statutory Authority in NSW is the Environment Protection Authority.

Appendix 1 Wipe tests on fixed radiation gauges

1. Objective

A wipe test on a fixed radiation gauge is used as an indicator to determine whether any radioactive contamination has leaked from the radioactive source contained within the gauge.

2. Items required to conduct a wipe test

- 2.1 Wipe medium (a piece of filter paper or other suitable material of high wet strength and absorbent capacity).
- 2.2 Water or other liquid which will not attack the material of the gauge housing and which is known to be effective in removing the radioactive substance involved.
- 2.3 Surgical gloves.
- 2.4 Forceps or tongs.
- 2.5 Plastic bags.
- 2.6 Identification labels/markings pen.
- 2.7 Extendable arm mirror device.

3. Wipe test method

- 3.1 The wipe medium shall be moistened with water, or other appropriate liquid, and used to wipe test an area of several square centimetres of the surface of the fixed radiation gauge housing at, or immediately adjacent to, the gauge shutter or source control mechanism. (An extendable arm mirror device may be needed to assist wipe testing if the position to be tested is otherwise inaccessible.)
- 3.2 Each wipe medium used for a wipe test shall be placed in an individual plastic bag which shall then be sealed after the following information is written on the bag, or on an identification label placed inside the bag:
 - (a) a description and identification (type and serial number) of the radiation gauge concerned
 - (b) a sketch of the radiation gauge showing the position(s) where the wipe test was carried out and the extent of the area wiped.
- 3.3 A number of recurrent wipe tests may be required on an individual fixed radiation gauge.

Note: Wherever possible the gauge shutter or source control mechanism shall be in the closed position when a wipe test is conducted.

4. Precautions

- 4.1 Surgical gloves shall be worn by the person doing the wipe test to minimise the possibility of radioactive contamination of the hands.
- 4.2 Where appropriate, forceps or tongs shall be used to minimise radiation exposure of the hand of the person doing the wipe test.

- 4.3 Where practicable, the shutter or source control mechanism of the gauge shall be closed before doing the wipe test.
- 4.4 If the shutter or source control mechanism cannot be closed, care shall be taken that the person doing the wipe test is not exposed to primary beam radiation.
- 4.5 The sealed plastic bag containing the wipe medium shall not be opened prior to measurement of the radioactivity of the wipe medium.

5. Measurement of radioactivity on the wipe medium

- 5.1 Immediately after the wipe test the wipe medium shall be checked at the radiation gauge site (e.g. with a Geiger-Muller counter) to determine whether any gross contamination is present.
- 5.2 The laboratory apparatus used for the final measurement of radioactivity on the wipe medium shall be suitable for the type and energy of ionizing radiation involved; it shall be calibrated at intervals not exceeding one year.
- 5.3 The person who makes the final measurement of radioactivity on the wipe medium, using laboratory apparatus, shall be competent to operate the apparatus and shall be able to interpret the results correctly. That person shall provide the CRE with the following information for each wipe test:
 - (a) confirmation that the plastic bag containing the wipe medium was sealed when received
 - (b) the date of receipt of the plastic bag containing the wipe medium
 - (c) the information, on, or in, the plastic bag relating to the radiation gauge which has been wipe tested
 - (d) the amount of radioactivity measured on the wipe medium and the date of measurement
 - (e) the type and serial number of the apparatus used for the measurement.

6. Wipe test report to owner of a fixed radiation gauge

- 6.1 The accredited CRE who provides a wipe test report to the owner of a fixed radiation gauge is responsible for ensuring that:
 - (a) the wipe test has been carried out properly; and
 - (b) the radioactivity on the wipe medium has been measured accurately and interpreted correctly.
- 6.2 The wipe test report for a fixed radiation gauge shall contain the following information:
 - (a) name and address of the registered owner
 - (b) serial number and type of the fixed radiation gauge housing
 - (c) serial number and type of fixed radiation gauge source
 - (d) location of the fixed radiation gauge
 - (e) result of the wipe test and date when carried out
 - (f) type and serial number of the apparatus used to measure the radioactivity on the wipe medium

- (g) full name and signature of the accredited CRE who did the wipe test and provided the wipe test report
- (h) name and affiliation of the person who measured the radioactivity on the wipe medium if different from (g) above.

Note: A wipe test shall be considered positive if the radioactivity measured on the wipe test medium exceeds 20 Bq.

Bibliography

ARPANSA 2007, *Radiation Protection Series 13: Code of Practice and Safety Guide for the Safe Use of Fixed Radiation Gauges*, Australian Radiation Protection and Nuclear Safety Agency, Yallambie, Vic

ISO 1980, *ISO 2919:1980(E): Sealed Radioactive Sources – Classification*, International Organisation for Standardisation, Geneva.

ISO 1992, *ISO 9978:1992(E): Radiation Protection - Sealed Radioactive Sources - Leakage Test Methods*, International Organisation for Standardisation, Geneva.

National Bureau of Standards 1977, *NBS Handbook Vol. 126, American National Standard N542-1977, Sealed Radioactive Sources, Classification*, National Bureau of Standards, Gaithersburg, MD.

Standards Australia 2003, AS 2205 1 to 10, *Methods of Destructive Testing of Welds in Metals*, Standards Australia, Sydney.