



Australian Government

Department of Education, Employment and Workplace Relations

PSPRAD401 Monitor radiation

Release: 1

PSPRAD401 Monitor radiation

Modification History

Release	TP Version	Comments
1	PSP12V1	Primary release. Supersedes and is equivalent to PSPRAD707A. AQF indicator updated to reflect usage.

Unit Descriptor

This unit covers the ability to safely monitor radiation and the exposure of people and environment during radiation-related work activities. This involves identifying information about the work activities to be monitored, using the specified monitoring equipment, and applying safe working rules and monitoring procedures to obtain reliable results. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

Application of the Unit

This unit of competency applies to personnel working in radiation-related work activities, including:

- extracting, milling, processing and packing radioactive ores
- operating, installing, servicing and calibrating fixed radiation gauges, bore hole logging or industrial radiography equipment, and moisture and density gauges
- decontaminating and servicing equipment that has been in contact with radioactive material
- XRF and XRD analysis
- collecting, preparing and testing samples containing radioactive materials
- using radionuclides in a laboratory

The activities may take place:

- at a mine or plant that processes radioactive ore and minerals
- with instruments that emit ionising radiation at geotechnical, construction, mining and manufacturing sites, or analytical and research facilities
- in a laboratory or licensed facility that handles radioactive materials
- in a nuclear facility

The tasks would be performed under the authority of a responsible person and with the advice of a radiation safety professional, such as a radiation safety officer and in accordance with radiation protection safety standards, codes and guidelines.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for assigned monitoring tasks	1.1. Use organisation's radiation management plans to obtain information about the hazards associated with assigned tasks and the monitoring equipment and safe working rules to be used at the site, and refer to radiation protection safety standards, codes and guidelines if necessary. 1.2. Liaise with relevant site personnel to arrange access and confirm the nature and likely duration of assigned monitoring tasks. 1.3. Perform and record pre-use checks of radiation instruments and tag or replace faulty items as necessary. 1.4. Check that personal protective equipment (PPE) and other task-related equipment is fit for purpose. 1.5. Stow all radiation instruments and monitoring equipment to ensure safe transport to the site and within the site if required.
2. Obtain reliable monitoring data or samples	2.1. Apply safe working rules to minimise personal ionising radiation exposure according to relevant radiation protection safety standards, codes and guidelines. 2.2. Operate radiation instruments in accordance with radiation management plans and manufacturer specifications. 2.3. Conduct regular instrument checks and minor maintenance if required. 2.4. Conduct repeat measurements for quality control purposes in accordance with procedures, and identify and report atypical equipment response. 2.5. Collect and label environmental samples using specified equipment and procedures to preserve their integrity if required. 2.6. Record atypical radiation conditions. 2.7. Seek advice to deal with any situation beyond own technical competence.
3. Complete assigned monitoring tasks	3.1. Check for contamination of equipment. 3.2. Re-stow all radiation instruments and monitoring equipment to ensure safe transport from the site and within the site if required. 3.3. Record use of PPE and radiation instruments in accordance with radiation management plans. 3.4. Before storing PPE, radiation instruments and monitoring equipment, check their condition in accordance with manufacturer's recommendations and radiation management plan.

- 3.5. Store any samples to preserve their integrity, security and traceability in accordance with sampling procedures.
- 3.6. Organise the management of any waste in accordance with organisation's procedures.
- 4. **Analyse monitoring data and report results**
 - 4.1. Record results in accordance with procedures.
 - 4.2. Check that recorded outcomes are consistent with expectations.
 - 4.3. Compare results with relevant radiation limits and identify and record any significant differences or atypical results.
 - 4.4. Identify potential or actual radiation protection issues revealed by the site monitoring tasks.
 - 4.5. Identify potential improvements that could be made to monitoring at site.
 - 4.6. Maintain ***required records*** that are complete, accurate, legible and secure.
 - 4.7. Provide site and personal radiation data to authorised personnel if required.
- 5. **Respond to potential or actual radiation incidents**
 - 5.1. Recognise unusual situations, unexpected hazards, and potential or actual emergency ***radiation incidents***.
 - 5.2. Inform the responsible person or delegate about the situation, hazard or incident and seek their advice.
 - 5.3. Initiate appropriate workplace emergency first response in accordance with instructions, radiation management plans and organisation's ***response procedures***.

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- recognising different types of monitoring equipment, such as air proportional, gas proportional, gas ionisation, Geiger-Muller, scintillation, neutron monitors, solid state, and personal dosimeters (badge and electronic)
- recognising the limitations, restrictions and applicability of these various detector units
- using relevant information sources to locate and interpret information about radiation sources and equipment encountered in job role or duties
- conducting pre-use checks for radiation instruments and monitoring equipment used in job role or duties
- interpreting manuals for radiation monitoring equipment used in job role or duties
- collecting, labelling and preserving occupational and environmental samples if required in job role or duties
- processing and analysing radiation monitoring data
- regularly assessing and reassessing risks and hazards and taking appropriate protective measures
- safely operating radiation instruments and monitoring equipment used in job role or duties to obtain reliable data
- seeking advice and further directions when faced with unforeseen circumstances or situations that may require decisions or response actions beyond technical competence
- using and caring for PPE used in job role

Required knowledge

- terms and concepts, such as ionising radiation, radioactivity, radioactive material, activity, dose, contamination, contamination controls, shielding, half-life, and radionuclide
- types and properties of ionising radiation (e.g. alpha, beta, gamma, neutron, x-ray, and electron), sources and shielding methods
- definitions of radiation quantities, such as exposure, dose, effective dose, dose rate, dose equivalent, and dose limits
- international system (SI) of units for radiation quantities, multiples and sub-multiples
- function of key components and operating principles of radiation instruments and monitoring equipment used in job role
- guidelines and safety procedures for working with radiation sources, based on principles of:
 - reducing exposure time
 - maintaining greatest distance
 - using as much shielding as possible
- health, safety and workplace emergency response procedures relevant to job role or

duties

- techniques and procedures for collecting potentially radioactive samples, if required in job role or duties
- techniques for assessing radiation hazards likely to be encountered in job role or duties
- techniques for conducting monitoring surveys used in job role or duties

Evidence Guide

The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

Assessment must confirm the ability to:

- work safely in a radiation environment
- detect ionising radiation and contamination
- obtain reliable data and samples to quantify radiation and contamination
- process radiation data and report results
- keep accurate and complete records relevant to job role or duties

Consistency in performance

Competency should be demonstrated by safely undertaking a variety of radiation monitoring tasks involving the use of appropriate radiation monitoring equipment.

Context of and specific resources for assessment

Competency should be assessed in the workplace or a simulated workplace environment.

Assessment must comply with:

- local regulations regarding the registration of operators, premises and sources at workplaces where radioactive materials and/or ionising radiation equipment are present
- organisation's radiation management plan
- manufacturer's instructions for operating radiation monitoring equipment

Access may be required to:

- registered premises and sources
- supervision by a radiation safety professional
- radiation instruments and monitoring equipment
- appropriate PPE
- radiation management plan or procedures

Method of assessment

The following assessment methods are suggested:

- oral/written tests and calculations involving:
 - radiation terms, principles and quantities
 - set-up, calibration and basic maintenance of radiation instruments
 - selection and use of PPE
- analysis of monitoring case studies and reports
- review of radiation data, results and records generated by the candidate

- feedback from peers and supervisor that the candidate consistently applies relevant radiation protection and safety requirements
- observation of the candidate:
 - using and caring for PPE
 - using radiation instruments and monitoring equipment
 - undertaking a variety of tasks in a simulated radiation environment

In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency that are difficult to assess directly.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

<i>Radiation management plans</i> should include details of:	• work practices, such as safe working rules and emergency response procedures • roles and responsibilities of personnel • radiation monitoring requirements • control of an incident involving a source • storage of a source • accountability and records • other requirements that may have a bearing on safety
<i>Hazards</i> may include:	• inhalation of radioactive dust or gas • ingestion of radioactive dust or contaminated food or water • unexpected exposure to sealed or unsealed radiation sources or partially enclosed equipment that emits ionising radiation
<i>Monitoring equipment</i> may include:	• radiation instruments and survey meters, such as: • air proportional (alpha) • gas proportional (alpha, beta) • gas ionisation (gamma) • Geiger-Muller (beta, gamma) • ionisation (beta) • scintillation (alpha, beta, gamma) • solid state (alpha, gamma) • wipe test equipment • sample containers, shovels, augers, buckets, air/water pumps, and stainless steel bailers
<i>Safe working rules</i> will vary according to the type of source equipment and should include monitoring details, such as:	• for example, RPS No.13 Code of Practice and Safety Guide for Safe Use of Fixed Radiation Gauges (2007), which specifies that working rules include details of: • expected radiation levels around each fixed radiation gauge under the control of the responsible person • tests for non-fixed surface contamination where appropriate • occasions on which radiation surveys and contamination tests will be carried out

	• methods for conducting radiation surveys, wipe tests and other examinations required by the code, and for reporting and recording results • types and occasions for use of personal monitoring devices
--	--

<i>Radiation protection safety standards, codes and guidelines</i> may include:	• Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) radiation protection series publications, such as: • RPS No.1 Recommendations for Limiting Exposure to Ionizing Radiation (1995) and National Standard for Limiting Occupational Exposure to Ionizing Radiation (republished 2002) • RPS No.7 Recommendations for Intervention in Emergency Situations Involving Radiation Exposure (2004) • RPS No.6 National Directory for Radiation Protection, (December 2009) • RPS No.9 Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005) • RPS No.15 Safety Guide for the Management of Naturally Occurring Radioactive Material (NORM) (2008) • requirements of commonwealth, state and territory radiation protection and safety legislation • definition of a responsible person • Australian standards
<i>Monitoring tasks</i> may include:	• observation of personnel conducting work activities in controlled radiation areas • surveys and measurements for: • establishing background levels • identifying areas of elevated activity and possible contamination • identifying and quantifying radiation contamination at specified locations • locating discrete radiation sources • assessing integrity of packaging or shielding • determining the effectiveness of decontamination • locating contamination on personnel and equipment • verifying contamination control boundaries • collection of air, water, soil, plant and animal specimens to monitor contamination
<i>Personal protective equipment</i> may include:	• gloves, over-boots, safety hats, goggles, face masks, overalls and gowns • respirators or HEPA filter masks
<i>Ionising radiation</i> may	• x-rays, electrons, neutrons, gamma rays, beta particles and alpha particles emitted from radioactive materials,

include:	including sealed and unsealed sources • neutrons emitted from generator tubes • x-rays generated by industrial radiography equipment, XRF and XRD instruments
----------	--

<i>Instrument checks and minor maintenance</i> may include:	• battery changes • calibration checks • zero checks
<i>Required records</i> may include details of:	• approvals and authorisations granted by the appropriate authority • specifications of the radiation management plan and monitoring program • estimates of doses received by employees and by members of the public • health records of personnel and individual monitoring data • environmental radiation measurements • calibration, inspection and maintenance of radiation instruments and equipment • transport of radioactive sources • shipment of radioactive ores • radioactive waste disposal • procurement and disposal of radioactive sources • incidents and accidents involving exposure to radiation and corrective measures taken
<i>Radiation incidents</i> may include:	• exposure of unauthorised personnel entering a controlled area • personal exposure above statutory exposure limits and a monitoring result in excess of statutory derived levels of exposure • exposure from an uncontrolled, high hazard radioactive sealed source that: • has loss or destruction of shielding • is involved in a transport accident • is lost, missing or stolen • has a malfunction of its shutter or interlocks • has been dropped during removal from its container • has jammed in an unsafe position • exposure from equipment that emits ionising radiation and has: • loss or destruction of shielding • malfunction of its shutter or interlocks • exposure from dispersed radioactive material caused by: • leakage or radioactive contamination • industrial or laboratory accident • uncontrolled releases of radioactive materials from a mine site, such as dust or contaminated water

	• dispersion of contaminants following destruction of a high activity sealed source
<i>Response procedures</i> will include:	• instructions for keeping exposures to a minimum, consistent with essential operations through evacuation or otherwise • instructions for notifying the relevant competent authority if required

Unit Sector(s)

Not applicable.

Competency field

Radiation Safety.