



Australian Government

Department of Education, Employment and Workplace Relations

PSPRAD706A Work safely with radiation-sealed source equipment

Revision Number: 2

PSPRAD706A Work safely with radiation-sealed source equipment

Modification History

PSPRAD706A Release 2: Layout adjusted. No changes to content.
PSPRAD706A Release 1: Primary release.

Unit Descriptor

This unit covers the ability to work safely when operating sealed source equipment that emits ionising radiation. This involves assessing risks before conducting the assigned work tasks, using recommended controls, applying safe working rules and emergency response procedures, monitoring radiation levels and completing required documentation. 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 authorised personnel who work at geotechnical, construction, mining and manufacturing, or analytical and research sites with any of the following sealed sources or equipment:

- industrial radiography equipment or gamma sources
- portable density and moisture gauges
- fixed source gauges, such as level, density, thickness and proximity
- bore hole logging
- portable XRD and XRF instruments.

The tasks assigned to personnel would be performed under the authorisation 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 tasks	1.1. Use organisation's radiation management plans to obtain information about hazards associated with the assigned tasks and monitoring equipment and safe working rules to be followed, and refer to radiation protection safety standards, codes and guidelines if necessary. 1.2. Liaise with site management to arrange access and confirm the nature and likely duration of assigned tasks. 1.3. Check that equipment required for assigned tasks is present and fit for purpose. 1.4. Record movement if required of source equipment in accordance with regulator's requirements and organisational procedures. 1.5. Stow source equipment and monitoring equipment to prevent damage and to ensure safe, secure transport to the site and within the boundaries of the site if required. 1.6. Check that transport vehicle is fit for purpose and has the required signage, if required.
2. Perform assigned tasks safely	2.1. Assess hazards at the site or prior to commencing assigned tasks, and seek advice if necessary. 2.2. Establish, or activate existing, boundaries and signage to control access to work area. 2.3. Perform pre-use and safety checks of source equipment and monitoring equipment and confirm they are fit for purpose. 2.4. Apply safe working rules and any other site control measures to minimise exposure to personnel and/or members of the public during assigned tasks. 2.5. Perform assigned tasks in the minimum safe time and in accordance with regulator's requirements, equipment manufacturer's recommendations and organisation's procedures. 2.6. Verify that radiation measurements are below specified levels throughout assigned tasks. 2.7. Seek advice to deal with any situation beyond own technical competence. 2.8. Record required data and note any atypical site conditions or problems encountered and the actions taken.
3. Complete assigned tasks	3.1. Confirm that source has been returned to the fully shielded position within its container.

- 3.2. Check for contamination and if necessary perform personal decontamination in accordance with radiation management plan.
- 3.3. Re-stow source equipment and monitoring equipment to prevent damage and to ensure safe, secure transport from the site and within the boundaries of the site, if required.
- 3.4. Record use of radiation source equipment and monitoring equipment in accordance with radiation management plans.
- 3.5. Check the condition of all equipment before storing it in accordance with manufacturer's recommendations and radiation management plans.
- 3.6. Manage all waste in accordance with regulator's requirements and organisational procedures.
- 3.7. Survey the work area following completion of assigned tasks prior to leaving the site.

4. Report findings and outcomes

- 4.1. Record monitoring data in accordance with requirements.
- 4.2. Compare monitoring results with relevant radiation limits and note any significant differences or atypical results.
- 4.3. Identify potential or actual radiation protection or safety issues revealed during monitoring of assigned tasks.
- 4.4. Identify potential improvements that could be made to monitoring or work practices at the site.
- 4.5. Report findings and outcomes of assigned tasks in accordance with organisation's procedures.
- 4.6. Maintain **required records** that are complete, accurate, legible and secure.

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 relevant personnel 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

- using relevant information sources to locate and interpret information about radiation source equipment
- conducting pre-use checks, for source equipment and monitoring equipment used in task
- interpreting manuals for source equipment and monitoring equipment used in job role
- processing data and verifying results
- regularly assessing and reassessing risks and hazards and taking appropriate protective measures
- safely operating source equipment and monitoring equipment used in task to obtain reliable data
- seeking advice and further directions when faced with unexpected situations that may require decisions or response actions beyond technical competence
- using and caring for personal protective equipment (PPE) and personal monitoring equipment required in job role

Required knowledge

- terms and concepts, such as ionising radiation, radioactivity, radioactive material, contamination, contamination controls, concentration, shielding, half-life, radionuclide, and safe distance
- 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
- exposure pathways and protective measures
- signs and symptoms of radiation exposure, radiation health effects, and deterministic and stochastic effects
- international system (SI) of units for radiation quantities
- function of key components, set-up checks and operating principles of source equipment and monitoring equipment used in task
- guidelines and safety procedures for working with radiation sources, based on principles of time, distance and shielding
- principles of optimising work practices to minimise exposure
- health, safety and workplace emergency response procedures, safe working rules, personal hygiene requirements and safe operating procedures for equipment relevant to job role
- PPE and monitoring equipment relevant to job role and task
- principles and techniques for decontamination of personnel in the field
- techniques for assessing radiation hazards likely to be encountered in task
- techniques for conducting monitoring relevant to task

- techniques for control, containment and/or confinement of radiation sources/equipment consistent with capabilities and required in task

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:

- safely conduct assigned tasks involving sealed radiation sources or equipment
- monitor radiation levels and contamination
- decontaminate people and surfaces
- process radiation data and report results
- keep accurate, complete and relevant records
- initiate appropriate workplace emergency first response.

Consistency in performance

Competency should be demonstrated by safely completing assigned tasks in a range of contexts, including sites, sealed sources, radiation equipment and complexity.

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.

Access may be required to:

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

Method of assessment

The following assessment methods are suggested:

- 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
- 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 case studies and reports of relevant emergency incidents and exercises
- observation of the candidate:
 - using, retrieving or containing dummy/actual radiation sources
 - using radiation equipment 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.

**Guidance information
for assessment**

Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example:

- PSPRAD703A Perform basic radiation measurements.

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.

Radiation

management plans

should include details of:

- work practices, such as safe working rules and emergency response procedures
- roles and responsibilities of personnel
- radiation monitoring requirements, including details of how the availability or accessibility requirements for the monitoring equipment are to be achieved
- control of an incident involving the source
- storage of the source
- transport of the source
- what to do with the source when it is no longer required, such as sale, transfer or disposal
- accountability and records
- other requirements that may have a bearing on safety

Hazards may include:

- inhalation of radioactive dust or gas
- ingestion of radioactive dust or contaminated food or water
- unexpected exposure to sealed radiation sources or partially enclosed equipment that emits ionising radiation

Monitoring

equipment may include:

- radiation instruments and survey meters, such as:
 - air proportional
 - gas proportional
 - gas ionisation
 - Geiger-Muller
 - ionisation
 - scintillation
 - solid state
- wipe test equipment

Safe working rules

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 should 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 any other examination required by the code, and for reporting and recording results
- information relating to:
 - operation of source or shutter controls
 - locking of source containers
- arrangements of locks and safety procedures and equipment for preventing exposure of persons to a radiation beam
- arrangements for preventing or minimising occupational and public radiation exposure
- methods for ensuring that no part of any person can enter the item of equipment to which the gauge is attached while the gauge is in the 'beam on' condition
- licence and registration requirements and conditions of the relevant regulatory authority
- special instructions from, or requirements of, the relevant regulatory authority
- arrangements for security of a gauge when it is in storage or being transported within the establishment
- regular inspection of all equipment, including:
 - source containers or housings
 - survey meters
 - personal monitoring devices
 - labels
 - markings
 - notices
- types and occasions for use of personal monitoring devices
- steps to be taken in the event of an emergency
- arrangements for the calibration, repair and maintenance of a fixed radiation gauge
- instructions concerning the posting of radiation warning signs in the vicinity of the gauge
- contact addresses and telephone numbers, including the after-hours emergency number, where relevant, for:
 - responsible person
 - relevant regulatory authority
 - service provider
 - provider of the personal monitoring service
- arrangements for disposal of a radioactive source, x-ray

Radiation protection safety standards, codes and guidelines may include:

- tube or neutron generator tube from a fixed radiation gauge, which need to be in accordance with the requirements of the relevant regulatory authority
- where necessary, details of a radiation isolation procedure for the gauge
- 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.2 Code of Practice for the Safe Transport of Radioactive Material (2008)
 - RPS No.7 Recommendations for Intervention in Emergency Situations Involving Radiation Exposure (2004)
 - RPS No.13 Code of Practice and Safety Guide for Safe Use of Fixed Radiation Gauges (2007)
 - RPS No.5 Code of Practice and Safety Guide for Portable Density/Moisture Gauges Containing Radioactive Sources (2004)
- Radiation Health Series produced by the National Health and Medical Research Council (NHMRC):
 - RHS No.31 Code of Practice for the Safe Use of Industrial Radiography Equipment (1989)
 - RHS No.28 Code of Practice for the Safe Use of Sealed Radioactive Sources in Borehole Logging (1989)
- requirements of commonwealth, state and territory legislation, such as Victorian Radiation Act (2005) and Radiation Regulations (2007) and associated licensing requirements
- definition of a responsible person

Site may include:

- fully enclosed laboratories or specialist facilities with permanent shielding and entrances that are locked/interlocked with alarms or signs
- partially enclosed sites, such as an exposure bay or a fixed radiation gauge with shielding, controlled access, alarms or signs
- open sites, such as field locations and processing plants where temporary boundaries, shielding and signage are erected and access is controlled by patrolling personnel

Pre-use and safety checks may include:

- confirmation that no unauthorised people are within boundaries

- confirmation that radiation instruments and survey meters are functioning within specifications
- inspection of:
 - source containers, housings, shielding, shutters and locks
 - personal monitoring devices
 - labels, markings, signage and notices
 - boundaries, locks and interlocks
- confirmation of source position
- confirmation of radiation levels in the vicinity of the radiation sealed source equipment

Site control measures
may include:

- hierarchy of control measures, including:
 - avoiding exposure, where practicable
 - isolating sources of radiation where practicable through shielding, containment and remote handling techniques
 - engineering controls
 - adopting safe work practices, including work methods which make appropriate use of time, distance and shielding to minimise exposure
 - using approved PPE where other means of controlling exposure are not practicable
- designation of controlled or supervised areas within workplaces with appropriate working rules for each, such as:
 - controlled exposure times
 - logging of personnel on entry and exit

Required records
may include:

- estimates of doses received by employees and members of the public
- site radiation measurements
- calibration, inspection and maintenance of radiation instruments and equipment
- transport of radioactive sources
- details of incidents and accidents involving exposure to radiation and the actions taken

Radiation incidents
may include:

- exposure of unauthorised personnel entering a controlled area
- 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:
 - industrial or laboratory accident resulting in radioactive contamination
 - dispersion of contaminants following destruction of a high activity sealed source
- Response procedures** 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.