



Australian Government

Department of Education, Employment and Workplace Relations

PSPRAD710A Apply radiation safety knowledge to develop and implement ionising radiation management plans

Release: 2

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Modification History

PSPRAD710A Release 2: Layout adjusted. No changes to content.
PSPRAD710A Release 1: Primary release.

Unit Descriptor

This unit covers the competencies required to develop and implement a radiation management plan to ensure the protection of workers, public and the environment, including emergency response. It includes ensuring adequate provision of training for all personnel and developing and sustaining a radiation safety culture to ensure that legislative and organisational requirements are met.

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 primarily responsible for organisation-wide radiation safety within their organisation. They may work as the radiation safety officer. Such personnel may work:

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

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. Analyse the requirements for a radiation management plan	1.1. Review relevant radiation protection and safety legislation, standards, codes and guidelines to confirm radiation protection and safety requirements detailed in radiation management plan. 1.2. Review relevant, available records and information about hazards due to radioactive materials, equipment and work activities of the organisation. 1.3. Identify known and potential hazards associated with current or future radiation-related work activities. 1.4. Procure radiation instruments and monitoring equipment and locate measuring or survey procedures to quantify hazards. 1.5. Quantify radiation hazards and anticipated exposure/dose, and compare results with relevant limits. 1.6. Source information and make recommendations about relevant radiation control measures, safety procedures, radiation monitoring programs and personal protective equipment (PPE). 1.7. Undertake organisational risk assessment in relation to ionising radiation safety.
2. Develop and/or revise organisational radiation protection program	2.1. Identify organisational compliance against radiation safety requirements, including organisational policy and approach, and review organisation's procedures for developing or revising radiation protection policy, procedures and plans. 2.2. Identify critical groups potentially affected by radiation practices conducted by whole of organisation, including workers, the public and the environment. 2.3. Undertake critical group analysis and cost-benefit analysis component of radiation management plan to identify key performance indicators. 2.4. Design or amend radiation management plans to control and monitor radiation-related work activities conducted by the organisation and comply with regulator requirements. 2.5. Submit radiation management plans to the responsible person for approval in accordance with organisational procedures and regulator requirements. 2.6. Design a strategy for implementing the new/revised organisational radiation management plans that identifies key people, recommended approaches and resources available. 2.7. Distribute plans to relevant personnel and confirm they understand their roles and responsibilities.

- 2.8. Identify organisational key performance indicators for radiation safety performance measurement and negotiate targets for these indicators.
- 2.9. Develop and implement quantitative risk management/risk assessment tools for radiation.

- 3. Ensure organisational radiation protection and monitoring systems are implemented effectively**
 - 3.1. Ensure all personnel understand their roles and responsibilities under the new or revised authorised radiation management plans.
 - 3.2. Ensure information about radiation protection and monitoring equipment and procedures is provided to relevant personnel.
 - 3.3. Ensure that prescribed radiation signs and safety communication systems, including noticeboards, are maintained in good condition and are readily visible.
 - 3.4. Approve appropriate audit plans and audit tools.
 - 3.5. Ensure audits of radiation protection and monitoring systems, equipment and safety performance are conducted in accordance with agreed audit plans.
 - 3.6. Analyse audit information to identify non-conformances and opportunities for improvements and provide recommendations to the licensee or responsible person on non-compliance and opportunities for improvement.
 - 3.7. Ensure all findings, actions and outcomes are documented in accordance with regulator requirements and organisational procedures.
- 4. Investigate and rectify organisational safety, quality and non-compliance issues**
 - 4.1. Review atypical dose results with reference to radiation safety key performance indicators.
 - 4.2. Examine any defect or changes in work practice, equipment or hazards that could increase exposure of personnel or present an environmental risk at organisational or systemic level and determine appropriate controls.
 - 4.3. Analyse instances of potential or actual non-compliance and redesign work practices or procedures to prevent recurrence.
 - 4.4. Approve and implement changes in work practices to further improve the organisation's radiation protection and monitoring systems.
 - 4.5. Maintain records of all actions and outcomes in accordance with regulator requirements and organisational procedures.
- 5. Inform the licensee about radiation protection and safety**
 - 5.1. Review status reports, including details of instances of potential or actual non-compliance or incidents or accidents and actions taken.
 - 5.2. Review information about the adequacy of radiation management plans and protection and monitoring systems, and recommend improvements.
 - 5.3. Procure significant equipment purchases.
 - 5.4. Authorise corrective and preventative actions in accordance with organisational procedures and regulator requirements.

- 5.5. Engage external radiation specialists as required.
- 6. **Promote a radiation safety culture**
 - 6.1. Implement mechanisms to ensure the competency of personnel to safely undertake specific radiation-related work activities, and make recommendations to the responsible person.
 - 6.2. Regularly review organisation's **learning and development strategies** and needs to ensure they meet organisational and regulator requirements.
 - 6.3. Actively promote the need to make doses as low as reasonably achievable consistent with legislation, and organisational policy and procedures.
- 7. **Establish information management systems about radiation protection and safety**
 - 7.1. Specify all information that must be recorded and secured, and advise relevant personnel.
 - 7.2. Maintain **required records** that are complete, accurate and legible and in accordance with inspection and security requirements of appropriate authority.
 - 7.3. Control access to records in accordance with organisational procedures.
 - 7.4. Provide reports in accordance with regulator requirements and organisational procedures.
 - 7.5. Maintain and secure records, and resolve problems in record management promptly.
 - 7.6. Regularly review the organisation's training requirements in radiation protection/safety, workplace emergency response and environmental protection, taking into account the needs of **stakeholders**.
- 8. **Respond to potential or actual radiation incidents or accidents**
 - 8.1. Respond to potential **radiation incidents**, which may include unusual situations, unexpected hazards, or potential or actual emergency incidents.
 - 8.2. Inform relevant personnel about the situation, hazard or incident.
 - 8.3. Assist emergency response personnel to control the situation 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

- source and analyse new and existing information regarding radiation protection, legislation, standards, codes and guidelines
- review and implement appropriate controls for organisation-wide radiation hazards
- review and implement controls to minimise the risks of radiation hazards for practices within the control of the responsible person
- ensure that the legislative responsibilities of the licensee are fulfilled
- implement radiation safety and related policies, procedures and practices
- ensure that audits occur consistent with organisational policies and procedures
- identify and procure radiation sources and equipment
- review and make recommendations in relation to monitoring surveys and data analysis
- provide advice and authorise reports and make decisions within scope of authority
- communicate effectively using plain English to explain radiation protection and safety issues, safe working rules and recommended procedures to other personnel
- regularly review training needs in radiation protection and safety, workplace emergency response and environmental protection
- undertake research to ensure that the legislative responsibilities of the licensee are fulfilled

Required knowledge

- terms and concepts, such as ionising radiation, radioactivity, radioactive material, NORM, contamination, contamination controls, concentration, shielding, half-life, radionuclide, transport index, safe distance, and weighting factor
- types and properties of ionising radiation 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 and calibration checks, and operating principles of radiation instruments, dosimeters and equipment used in job role
- detailed requirements of relevant legislation, codes, guidelines and safety procedures for working with radiation sources/equipment used at the organisation's facilities or sites
- health and safety and workplace emergency response procedures for radiation-related work activities in organisation
- types of PPE for personnel working in ionising radiation environments and the recommended selection process
- potential adverse health and performance effects of wearing PPE while working in

potentially hazardous environments

- principles and techniques for decontamination of personnel and equipment
- techniques and procedures for collecting potentially radioactive samples
- techniques for assessing radiation hazards likely to be encountered in organisation
- techniques for conducting contamination surveys
- techniques for control, containment and confinement of radiation sources/equipment encountered by organisation.
- environment, health and safety policy and procedures of the organisation, particularly how different parts of occupational hygiene system are interdependent, such as ventilation, noise, radiation and chemicals
- working knowledge of the business activities and operations conducted at the organisation's sites and the associated radiation risks
- critical group analysis, cost-benefit analysis and assessment processes to develop cost effective radiation protection programs
- sources of industry information and information from relevant professional bodies to maintain currency

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.

Overview of assessment	Competency must be demonstrated by the development and implementation of a radiation management plan to ensure the protection of workers, public and the environment, including an emergency response.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessment must confirm the ability to: • establish and maintain an organisation-wide radiation management plan that meets regulator requirements and organisational procedures • monitor radiation-related work activities and take appropriate action to keep workplace exposure as low as reasonably achievable and to keep doses received below the relevant dose limits and to protect the environment • identify and rectify radiation safety, quality and non-compliance issues • advise the licensee about radiation safety issues • explain radiation protection and safety measures clearly and train personnel • manage radiation protection and safety information in accordance with regulator requirements and organisational procedures • coordinate workplace emergency first response. Consistency in performance Competency should be demonstrated by performing radiation safety related components of the day-to-day functions and duties of a radiation safety officer at organisational level.
Context of and specific resources for assessment	Competency should be assessed in the workplace. 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 is required to: • registered premises and sources • organisation's radiation management plan and related policies and procedures.
Method of assessment	The following assessment methods are suggested:

- review of radiation results, records, management plans and reports generated by the candidate
- review of radiation safety information developed by the candidate and provided to the work group
- feedback from peers, manager and regulator representative that the candidate is able to coordinate management of radiation safety
- oral and 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 promoting radiation safety and providing radiation safety information and instruction to other personnel.

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,

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 protection and safety legislation, standards, codes and guidelines may include:

- Australian Radiation Protection and Nuclear Safety Act 1998 and amendments 2005
- commonwealth, state and territory radiation control legislation
- 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 (2004)
 - 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.

Radiation management plans may include:

- plan to keep exposure to radiation in the workplace as low as reasonably achievable and to keep doses received below the relevant dose limits, including:
 - designation of work areas to be controlled, and signage and location of protective devices
 - arrangements for authorising workers to conduct radiation-related activities
 - procedures for conducting radiation-related tasks and the safe use of radiation equipment
 - procedures for the security, storage and transport of

- radioactive materials and waste disposal
- procedures for the issue and collection, use and care of personal radiation monitors and PPE
- plan for monitoring radiation exposure and for assessing doses received by exposed employees, including:
 - dosimetry specifications
 - deployment of survey monitors
 - methods for conducting required radiation surveys, wipe tests, examinations and for reporting and recording results
 - arrangements for personal and environmental monitoring
- plan for dealing with incidents, accidents and emergencies involving exposure to radiation
- plan for the induction and ongoing training of workers, visitors and members of the public as appropriate
- plan for the selection, procurement, maintenance, repair and disposal of equipment containing radioactive sources
- audit plan covering:
 - status of specified equipment
 - use of designated safe work practices
 - application of specified monitoring procedures
 - accuracy and completeness of specified records.

Hazards due to radioactive materials, equipment and work activities may include:

- inhalation of radioactive dust or gas
- ingestion of radioactive dust or contaminated food or water
- unplanned exposure to sealed or unsealed radiation sources or partially enclosed equipment that emits ionising radiation
- handling radioactive materials in a laboratory.

Radiation-related work activities may include:

- extracting, milling, processing and packing radioactive ores and minerals
- operating, servicing and calibrating fixed radiation gauges, bore hole logging, and industrial radiography equipment
- operating, servicing and calibrating moisture density gauges
- decontaminating equipment that has been in contact with radioactive material
- XRF and XRD analysis
- using radionuclides in a laboratory
- managing wastes
- using radiation for quality control in processing systems and factories.

Radiation instruments and monitoring equipment may include:

- air proportional
- gas proportional
- gas ionisation
- Geiger-Muller
- ionisation
- scintillation
- solid state
- wipe test equipment
- sample containers, shovels, augers, buckets, air/water pumps and stainless steel bailers.

Quantifying radiation may include:

- dose, effective dose and dose equivalent
- dose rate
- exposure.

Control measures may include:

- hierarchy of controls, including:
 - avoiding exposure, where practicable
 - isolating sources of radiation where practicable through shielding, containment and remote handling techniques
 - engineering controls to reduce radiation levels and intakes of radioactive materials in the workplace
 - adopting safe work practices, including work methods that make use of time, distance and

shielding to minimise exposure

- using approved PPE where other means of controlling exposure are not practicable or sufficient
- designation of controlled areas and supervised areas
- use of appropriate signs and labels
- use of investigation levels of exposure for specific categories of work.

Monitoring programs include:

- identifying relevant sources of radiation exposure within a workplace
- assessing radiation doses received by employees, including determining parameters that affect the assessed dose, as required by the appropriate authority
- assessing radioactive discharge to, or contamination of, the environment
- detecting changes in the circumstances of exposure, as necessary
- acquiring sufficient information on radiation exposure in the workplace to enable optimisation measures to be adopted
- **critical group analysis, which is a** process of assessing the doses to the small set of persons within the larger population most likely to receive the highest doses.

Ionising radiation may include:

- x-rays, electrons, neutrons, gamma rays, beta particles and alpha particles emitted from radioactive materials, including sealed and unsealed sources
- x-rays generated by industrial radiography equipment, XRF and XRD instruments.

Cost-benefit analysis in the context of radiation safety involves:

- process of calculating the health detriment from a radiation practice and assessing such detriment against the costs of improvements or other interventions to reduce such detriment
- using analysis to inform expenditure within radiation protection programs.

Designing or amending radiation management plans involves:

- identifying potential impacts of new or revised radiation management plans on relevant organisational policies, procedures and systems
- advising relevant personnel
- describing mitigation strategies to address probable impacts.

Learning and development strategies may include:

- face to face training
- online or distance learning
- mentoring and coaching.

Required records may include:

- approvals and authorisations granted by appropriate authority
- radiation management plans
- results of environmental surveys
- doses assessed to have been received by employees who work directly with radiation and by other employees as required by the appropriate authority, including details of monitoring results and of dose calculation methods
- details of training courses, participation in learning and

- development activities, and participation by employees
- details of incidents and accidents involving exposure to radiation and corrective measures taken
 - calibration, inspection and maintenance of radiation instruments and equipment
 - transport of radioactive sources
 - shipment of radioactive ores and minerals
 - procurement and disposal of radioactive sources
 - personal and environmental monitoring data
 - inspection and security requirements for records as determined by the appropriate authority.
- Stakeholders** may include:
- regulators or inspectors from the relevant competent authority
 - senior management in organisation
 - OHS and environmental safety representatives in organisation
 - production managers
 - union and employer representatives
 - workers.
- 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:
 - 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.
- 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.