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Australian Radiation Protection and Nuclear Safety Agency

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National Directory
for Radiation Protection

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Requests for information about the content of this publication should be addressed to ARPANSA, 619 Lower Plenty Road, Yallambie, Victoria, 3085 or by e-mail to secretariat@arpansa.gov.au.

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Produced by Australian Radiation Protection and Nuclear Safety Agency
619 Lower Plenty Road
YALLAMBIE VIC 3085

Telephone: +61 3 9433 2211

Facsimile: +61 3 9432 1835

e-mail: secretariat@arpansa.gov.au

Internet: www.arpansa.gov.au

Foreword

The purpose of the *National Directory for Radiation Protection* is to provide an agreed framework for radiation safety, including both ionizing and non-ionizing radiation, together with clear regulatory statements to be adopted by the Commonwealth, States and Territories.

The Australian Health Ministers' Conference endorsed the development of the *National Directory for Radiation Protection* in August 1999 as the means of achieving uniformity in radiation protection practices between jurisdictions. In particular, the Conference agreed that the *National Directory* would be prepared by the Radiation Health Committee for approval by the Conference, via a process for issues resolution which included meeting the COAG requirements for national standard setting. There would be full consultation with stakeholders in the development of the Directory.

The Australian Health Ministers' Conference agreed that upon consideration and approval of the provisions of the Directory, **the regulatory elements of the Directory shall be adopted in each jurisdiction as soon as possible, using existing Commonwealth/State/Territory regulatory frameworks.**

Ministers recognised that as a variety of agencies have a legislated responsibility for aspects of radiation safety (eg mines, occupational health and safety and transport agencies in many jurisdictions), these other agencies were to be involved actively in measures to progress national uniformity, including the development of the Directory.

Subsequently, the development of the National Directory was supported by the recommendations of the National Competition Policy Review of radiation Protection Legislation (May 2001), which was endorsed by all participating jurisdictions. Queensland did not participate in the NCP Review, but endorsed the recommendations relating to uniformity.

This first version of the *National Directory for Radiation Protection* was developed by a process designed to meet the COAG *Principles and Guidelines for National Standard Setting and Regulatory Action by Ministerial Councils and Standard-setting Bodies* (Nov 1997). This included the development of a regulatory impact statement and appropriate consultation with stakeholders. Given that AHMC had already made a decision to develop the Directory, the regulatory impact statement analysed the impact of provisions of the Directory and not other regulatory options.

Part A of the National Directory for Radiation Protection sets out the agreed overall framework for radiation protection in Australia. It is expected that jurisdictions will adopt these principles as reviews of legislation come forward. Part B of the Directory contains the uniform regulatory elements, which are to be adopted by each jurisdiction, within its particular regulatory framework. Part C of the Directory contains guidance that will assist regulators in adopting consistent approaches, but is not regulatory in nature.

John Loy
CEO of ARPANSA

Date

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1. Introduction

1.1 Citation

This publication should be cited as the *National Directory for Radiation Protection*.

1.2 Purpose

To provide an overall agreed framework for radiation safety, including both ionizing and non-ionizing radiation, together with clear regulatory statements to be adopted by the Commonwealth, States and Territories.

1.3 Scope

This Directory provides comprehensive resources to establish and maintain a uniform legislative framework for both ionizing and non-ionizing radiation protection in Australia. Although the Directory has been developed with the needs of radiation safety and protection agencies and regulators in mind, it is agreed that the Directory will also be used by all sectors involved in implementing radiation controls, including mining, mineral processing and occupational health and safety regulators.

1.4 Interpretation

The presence of the word “must” in a section indicates that the requirement to which it refers is considered to be mandatory. The presence of the word “should” in a section indicates a recommendation, that is, a requirement to be applied as far as is practicable to minimise risk¹. Sections containing the word “should” summarise agreed best practice in relation to a particular matter at the time of publication.

There are a considerable number of terms that have technical or legal significance, and are central to the national radiation protection framework. The meanings of terms used in this Directory are those defined in the Glossary.

1.5 Structure

This Directory is structured in three Parts. Part A sets out the agreed overall framework for radiation protection in Australia. It is expected that jurisdictions will adopt these principles as reviews of legislation come forward.

Part B of the Directory and the supporting Schedules contain the uniform regulatory elements, which are to be adopted by each jurisdiction, within its particular regulatory framework.

¹ In accordance with *Recommendations for Limiting Exposure to Ionizing Radiation and National Standard for Limiting Occupational Exposure to Ionizing Radiation (1995)*, re-published as an ARPANSA/National Occupational Health and Safety Commission publication, Radiation Protection Series (RPS 1), CEO of ARPANSA, March 2002.

Part C of the Directory contains guidance that will assist regulators in adopting consistent approaches, but is not regulatory in nature.

Annexes to the Directory provide advisory material and background information on the provisions of the Directory.

Notes in italics throughout the Directory are included for public comment purposes to assist in understanding the intended inclusions in future versions of the Directory. These notes will not be included in the final Directory.

PART A - General Principles

2. Regulatory frameworks

2.1 Objective of radiation protection legislation

Legislation must include the objective of the protection of the health and safety of people and the environment from the harmful effects of ionizing and non-ionizing radiation.²

2.2 Principles for regulatory frameworks

A “responsible person” is to be primarily responsible for radiation protection and safety. Nevertheless, regulators also need to establish and enforce standards through a system of regulation. Responsible persons are required to make notifications, or gain approvals and authorisations from regulators, before conducting a practice. These authorisations include registrations, licences and accreditations.

The regulatory frameworks in each Australian jurisdiction must follow the principles and requirements below³, to ensure that the objective of the legislation is met:

- (a) **Radiation protection principles** including justification of practices to ensure that benefits outweigh the detriment, limitation of radiation doses (see Schedule 1) to individuals from all practices, and optimisation of protection and safety so that individual doses, the number of people exposed and the likelihood of exposure are all kept as low as reasonably achievable.
- (b) **Management requirements** must be established to provide for responsible persons to establish a safety culture, establish quality assurance programs, reduce the contribution of human error to accidents, make appropriate training and information available to staff, allocate sufficient resources to enable safety and security of radiation sources over their lifetime (including disposal), and provide the qualified expertise necessary to observe the requirements.
- (c) **Technical requirements**, such as shielding design and interlocks must be established as necessary, to ensure that radiation sources remain within control, and that they are secure from theft or damage. Defence-in-depth measures in facility design and operating procedures, which are intended to prevent accidents, to mitigate the consequences of accidents and to restore safety should an accident occur, must be established as required within this Directory. Further, best engineering practice is to be followed throughout the life (siting, design, construction, operation and decommissioning) of a facility.
- (d) **Processes for verification of safety and security**, which involve safety assessments to identify and determine the magnitudes of radiation exposures during normal operation and accidents, and to assess the provisions for protection, safety and security, must be established. Procedures and equipment required for monitoring operations and verifying compliance with safety requirements and standards must be established and available. Appropriate records and reports must be maintained.

² In accordance with Recommendation 1 of the National Competition Policy (NCP) Review of Radiation Protection Legislation, May 2001

³ The principles for regulatory frameworks will require development of specific guidance on protection of non-human species, which will be included when international guidance on the issue becomes clear.

- (e) **Risk management principles**, which include a broader evaluation of risk assessment and take into account not only scientific data, but also the social and economic considerations.
- (f) **Intervention actions** for exposure situations requiring protective action to reduce or avert radiation exposures, or their likelihood (see section 6).

2.3 Powers and functions conferred by legislation

Legislation must establish a regulatory authority [the Authority⁴], which is effectively independent, and accountable to a Minister of the Crown and through that Minister to the Parliament. The legislation must prohibit any dealing with a radiation source without the appropriate authorisation. The administration of radiation control legislation in each jurisdiction must be the responsibility of the Authority. Legislation must bind the Crown and provide the following powers and functions to the Authority:

- (a) advise the Minister on radiation protection and nuclear safety matters;
- (b) set standards for radiation protection and the safety and security of radiation sources;
- (c) assess applications for authorisations against criteria specified in the Act or regulations;
- (d) grant, refuse, vary, revoke or suspend authorisations, and impose conditions on these;
- (e) grant exemptions from regulatory requirements and determine conditions for exemptions;
- (f) delegate its functions and powers to an officer or employee of the Authority;
- (g) ensure a system of periodic inspections, documentation and reporting to verify compliance with regulatory requirements;
- (h) enforce compliance with regulatory requirements;
- (i) require safety assessments and environmental assessments where appropriate;
- (j) accredit persons or classes of persons to assess compliance with the requirements of the legislation, and set the conditions to which they should be subject;
- (k) control the categories of non-ionizing radiation apparatus specifically identified in Schedule 2 of this Directory;
- (l) maintain a register of radiation sources, including requirements for amendment of the register;
- (m) charge fees for issuing, amending and renewing authorisations;
- (n) plan for, and give directions in the case of, a nuclear or radiological emergency;
- (o) require notification of radiation incidents to the Authority;
- (p) investigate radiation incidents, and provide reports to the Australian Radiation Incidents Register;
- (q) recover costs incurred by the Authority in relation to specified situations;
- (r) promote or conduct studies, investigations and research associated with radiation protection and nuclear safety, including public health and safety and environmental considerations; and
- (s) prepare an annual report for tabling before the Parliament.

⁴ Use of the term ‘the Authority’ throughout this Directory is not intended to preclude that a jurisdiction may choose to have more than one Authority to regulate different aspects of radiation protection.

2.4 Advisory body

Legislation should provide for the establishment of an advisory body to provide the Authority and the Minister with policy advice on radiation protection and nuclear safety matters.

2.5 Review of legislation

The legislation must be reviewed at intervals not exceeding ten years.⁵

2.6 Practices to which legislation applies

The practices to which the requirements of the legislation must apply include:

- (a) the manufacturing or possession of radiation sources;
- (b) the use of radiation or radioactive materials for medical (both diagnostic and therapeutic), dental, industrial, veterinary and agricultural purposes, in consumer products, education, training, research, or any practice which involves or could involve exposure to radiation or radioactive materials;
- (c) the preparation of a site for construction, operation, modification, decommissioning or release from regulatory control of nuclear installations, and radiation facilities specifically identified in this Directory;
- (d) practices involving exposure to natural sources specified by the Authority as requiring control;
- (e) practices dealing with radioactive material arising from exploration, mining, mineral processing or petroleum industries;
- (f) practices involving radioactive waste management and the disposal of radioactive material;
- (g) practices involving categories of non-ionizing radiation apparatus specifically identified in Schedule 2 of this Directory;
- (h) sale or transfer of responsibility of ionizing radiation sources and categories of non-ionizing radiation apparatus specified in this Directory;
- (i) transport of radioactive material; and
- (j) any other radiation-related practice specified by the Authority.

2.7 Categories of Authorisation

Legislation must provide for authorisations to regulate various dealings with radiation sources. Possession of the relevant authority will be a mandatory condition of engaging in a particular dealing, unless exemptions apply. The authorisation may be effected through a single authorisation covering various dealings or separate authorisations covering particular dealings, for example:

(a) Authorisation to possess

An authorisation to possess must be obtained by a responsible person who wishes to possess a radiation source, or otherwise be in control of a radiation source for a specified purpose, or to be responsible for a practice.

(b) Authorisation to use

⁵ This is in accordance with Recommendation 8 of the NCP Review of Radiation Protection Legislation, May 2001

An authorisation to use must be obtained by any natural person who wishes to use a radiation source for a particular purpose, and who is not otherwise authorised to use the source under an authorisation to deal.

(c) Authorisation for other dealings

An Authorisation must be obtained by a responsible person for dealings such as the siting, design, construction, installation, operation, maintenance, modification, decommissioning, release for unrestricted access, and disposal of nuclear installations and radiation facilities.

2.8 Suspension, variation or cancellation of an authorisation

An Authority must be able to suspend, vary or cancel an authorisation if there is evidence to suggest that:

- (a) the authorisation was obtained improperly;
- (b) the holder of an authorisation has contravened a condition of the authorisation;
- (c) the holder of an authorisation has been convicted of an offence against the legislation, under which the authorisation was granted, or other relevant legislation;
- (d) unless the authorisation is suspended, varied or cancelled there would be a risk to the health and safety of people or to the environment;
- (e) unless the authorisation is suspended, varied or cancelled there would be security risk from access to the radioactive source;
- (f) the holder has ceased to hold a qualification or meet other criteria, which formed the basis on which the authorisation was granted;
- (g) the holder of an authorisation has consistently made decisions that compromised radiation safety; or
- (h) the holder of an accreditation has ceased working as an accredited person.

Where an Authority makes a decision to suspend, vary or cancel an authorisation, it should advise all other relevant Authorities within and outside of its jurisdiction of that decision.

2.9 Annual reports

The Annual Report of an Authority should address the following key elements:

- (a) All activities and operations of the Authority for the year.
- (b) A summary of authorisations issued.
- (c) A summary of all radiation incidents investigated.
- (d) A summary of prosecutions undertaken by the Authority.

PART B – Uniform Regulatory Elements

3. Scope of Regulation

3.1 Exclusions

The following exposures whose magnitude or likelihood is essentially not amenable to control through legislation are excluded from regulation:

- (a) K-40 in the body;
- (b) Cosmic radiation at the surface of the earth; and
- (c) Unmodified concentrations of radionuclides in most raw materials, unless otherwise specifically identified in this Directory.

3.2 Exemptions

3.2.1 The general criteria for granting an exemption are:

- (a) The health risks associated with the source, practice, or type of person using a source are sufficiently low as to be of no regulatory concern; and
- (b) Radiation protection, including the cost of regulatory control, has been optimised⁶.

3.2.2 The criteria to exempt radioactive material⁷ or practices from notification, registration and licensing are:

- (a) The radioactive material has an activity concentration⁸ less than that prescribed in Schedule 3 or consists of or contains less than the activity prescribed in Schedule 3, or
- (b) the radioactive material has an activity concentration greater than that prescribed in Schedule 3 or consists of or contains greater than the activity prescribed in Schedule 3, but causes an annual effective dose to an individual member of the public of less than 10 μ Sv, and a collective effective dose to the critical group committed by one year of performance of the practice, as determined by the Authority, of less than 1 person.Sv, or
- (c) in the case of a mixture of radioactive materials, where each of the radioactive materials present does not exceed the individual activity or activity concentration, the mixture is defined as exempt if the sum of the fractions obtained by dividing the activity of each material present by the appropriate activity value from Schedule 3, or the sum of the fractions obtained by dividing the activity concentration of each material present by the appropriate activity concentration value from Schedule 3, does not exceed 1.
- (d) in the special case of exposure to naturally-occurring radon-222 in the workplace, the criterion for exemption is that the concentration of radon-222 is less than 1000 Bq/m³.

⁶ For ionizing radiation as defined and explained in RPS 1. For non-ionizing radiation, optimisation can be equated to cost-effectiveness.

⁷ The definition of radioactive material and the exemption levels for activity and activity concentration for particular radionuclides in this Directory are based on those of the International Atomic Energy Agency. The rationale for the definition and exemption levels is provided in Annex 2.

⁸ The “activity concentration” of a radionuclide means the activity per unit mass of the material in which the radionuclide is essentially uniformly distributed. [A sealed source in a lead surround does not constitute being uniformly distributed]. The activity concentration limits were calculated on the basis of small to moderate size sources (ie less than about 1 m³). Bulk amounts of material may require further consideration by the Authority and may be limited by the dose criteria.

- (e) The Authority may exempt material or practices that are not exempt under (a)-(d) above, subject to conditions that may be determined by the Authority⁹, where an assessment for the optimisation of protection shows that exemption is the optimum option. When this provision is used, the Authority must notify the Radiation Health Committee immediately after granting the exemption.
- (f) The Authority may declare material or practices otherwise exempt under (a)-(e) above to be subject to the legislation if an assessment of the magnitude of individual doses, the number of people exposed and the likelihood that potential exposures will actually occur justify the practice being subject to the legislation. When this provision is used, the Authority must notify the Radiation Health Committee immediately after granting the exemption.

3.2.3 Ionizing radiation apparatus on the list below must be exempted from notification, registration or licensing requirements:

- (a) television receivers;
- (b) visual display units;
- (c) cold cathode gas discharge tubes;
- (d) electron microscopes; or
- (e) an instrument or apparatus in which electrons are accelerated to an energy not exceeding 5 keV.

4. Authorisations

4.1 Authorisations to Possess

A person or corporation seeking to possess or be in control of a radiation source for a specific purpose (a “responsible person”) must hold an authorisation to possess, issued by the Authority.

Legislation in each jurisdiction places significant responsibilities and obligations on holders of such authorisations. Many of these responsibilities will be dealt with specifically on a practice type by practice type basis in Codes of Practice, however some requirements might be placed in future versions of this Directory if they are generally applicable or if they amend or over-ride instructions in Codes of Practice. These will be added as they are developed by the Radiation Health Committee.

Obligations on holders of such authorisations may include:

- *ensuring a radiation protection plan for the practice is developed and implemented;*
- *ensuring all radiation sources meet appropriate standards for safe use, that they are registered and that they have been assessed by an accredited person;*
- *ensuring all radiation sources are satisfactorily secured;*
- *ensuring all facilities in which radiation sources are used meet the appropriate radiation safety standards and that they are checked by an accredited person;*
- *ensuring all persons who use radiation sources are properly authorised to do so;*
- *ensuring appropriate safe handling and other safety equipment and clothing is provided to users of the sources and other persons as required, and is worn;*
- *ensuring they are advised by a competent radiation safety officer;*
- *if unsealed radioactive substances are involved in the practice, ensure that unsealed radioactive materials are disposed of in a way that is approved of by the Authority;*

⁹ Where an exemption is granted, the exemption should be able to be subject to appropriate conditions, such as reporting and monitoring.

- *ensuring that radiation doses arising from the radiation practice are kept below the limits and as low as reasonably achievable;*
- *providing personal radiation monitoring devices to relevant persons;*
- *keeping personal radiation monitoring records for persons exposed in the practice;*
- *ensuring radiation-related equipment is properly maintained;*
- *ensuring that the transport of the person's radioactive substances is in accordance with the Code of Practice for the Safe Transport of Radioactive Material (2001); and*
- *notifying the Authority in the event of an incident.*

4.2 Authorisations to Use

4.2.1 Competency Requirements

The Mutual Recognition Act 1992 and the Trans-Tasman Mutual Recognition Act 1997 apply within Australia and have the effect of facilitating the recognition of equivalent occupations.

If a natural person in a jurisdiction meets the requirements as set out in Schedule 4 of this Directory, that person will be granted authorisation to use the specified radiation source for the specified purposes in that jurisdiction.

The RHC will consider competency and/or pre-requisites for obtaining authorisation to use radiation sources for specified practices progressively over time and incorporate the agreed requirements in a future version of this Directory in Schedule 4.

The occupations and professions who may use a radiation source and whose members will typically be required to meet competency requirements include:

- *Medical practitioners (including specialists);*
- *Dental practitioners (including dental therapists and dental hygienists);*
- *Veterinary surgeons;*
- *Diagnostic radiographers;*
- *Radiation Therapists;*
- *Nuclear Medicine Technologists;*
- *Health & Medical Physicists;*
- *Chiropractors;*
- *Industrial radiographers;*
- *Borehole loggers;*
- *Radiation source testers; and*
- *Persons servicing, installing, commissioning, maintaining, repairing, or manufacturing radiation sources.*

4.2.2 Security requirements

Any person making application for authorisation to deal with a radiation source must meet the security requirements as set out in Schedule 6 of this Directory.

4.2.3 Requirements for authorising practices

Requirements applied to authorisations for practices by the Authority must include the set of requirements specified in Schedule 5 for the relevant categories.

The introduction of nationally uniform minimum set of requirements is an important element of uniformity. A minimum set of nationally agreed requirements is to be developed by the RHC to cover key practices. Once these 'model' requirements have been agreed nationally, the same practice carried out in different jurisdictions will be subject to the same requirements.

Model requirements covering practices including the following, will be developed and incorporated into a future version of this Directory in addition to those specified in Schedule 5:

Use for non-medical purposes;

Use for medical purposes (including radiology, radiography, restricted radiography in rural/remote areas, radiation oncology, cardiology, nuclear medicine, chiropractic, dentistry, and veterinary practice);

Use by installers/repairers;

Sale or transfer of responsibility of radiation sources;

Mining and mineral processing;

Disposal of radioactive materials;

Management of radioactive waste facilities; and

Possession and operation of prescribed facilities.

4.2.4 Services for rural and remote areas

A natural person may be granted permission to undertake a restricted range of health-related diagnostic radiological services without holding the relevant professional qualifications contained in Schedule 4 of this Directory only if:

- (a) The practice is to be carried out in an area recognised as an 'area of need' for particular services;
- (b) Reasonable efforts have been made to attract an appropriately trained and accredited professional to the position;
- (c) The person has undertaken training accredited by the Authority for the purpose; and
- (d) Appropriate conditions and restrictions, including a requirement for periodic review, are placed on the authorisation in regard to the services permitted to be provided.

4.3 Registrations

4.3.1 Requirement to Register

All apparatus, sources and premises in the categories specified in this Directory must be registered. The categories to which registration applies are:

- (a) Sealed sources of radioactive materials, sealed source apparatus, radiation apparatus, non-ionizing radiation apparatus specified in this Directory, and the premises on which these radiation sources and apparatus are secured, stored, used or manufactured;
- (b) premises at which unsealed radioactive sources are stored or used; and
- (c) in the case of radiation sources that are intended for portable or field use, the sources and the principal place of storage.

4.3.2 Criteria for registration

Registrations allowing the use of a radiation source or premises must only be issued when those criteria considered necessary for the safe operation and security of the radiation source or the premises are met.

Standard criteria for radiation source and premises registrations will be developed and incorporated into a future version of this Directory in Schedule 7.

4.4 Accreditation of third party service providers

A future version of this Directory will specify in Schedule 8 nationally agreed categories of accreditations, standard requirements for accreditation, national accreditation processes and guidelines and functions suitable for outsourcing by an Authority. The Implementation Plan for the National Competition Policy Review of Radiation protection Legislation include a project on 3rd party certification, which is intended to provide an agreed set of regulatory functions that could be undertaken by accredited persons, and an agreed set of principles and guidelines for the development of accreditation standards and processes.

5. National Adoption of Codes and Standards

5.1 Adoption by direct referencing

Codes and Standards referenced in this section must be adopted by Authorities within their regulatory frameworks. This should be done preferably by direct reference to a Code or Standard in the regulations of an Authority, but may be achieved by using a Code or Standard as conditions of licence and/or registration issued by an Authority. The referenced Codes and Standards are listed in Schedule 9.

The RHC will, progressively over time, agree on more Codes and Standards that must be adopted by jurisdictions and reference these Codes and Standards in Schedule 9 of future versions of this Directory as these Codes and Standards are promulgated under ARPANSA's Radiation Protection Series.

5.2 Adoption of extracts from Codes and Standards

Extracts from Codes of Practice or Standards specified in this section and detailed in Schedule 10 must be adopted by Authorities within their regulatory frameworks.

The RHC will, progressively over time, agree on extracts to be adopted by an Authority in its legislative framework and describe such agreed extracts in Schedule 10 of future versions of this Directory.

5.3 Adoption of national radiation incident reporting framework

An Authority must report to the Australian Radiation Incidents Register, radiation incidents of the types described in Schedule 11.

Required timelines for reporting particular incident types are to be included in schedule 11.

PART C – Guidance for Best Practice

This section will contain guidance information to assist regulators. It will also, where appropriate, provide background information and rationale for provisions in other parts of this Directory. This section will be completed in a future version of this Directory.

6. Intervention in Radiological Emergencies and Chronic Exposure Situations

6.1 Basic Obligations

In order to reduce or avert exposures in intervention situations, protective actions or remedial actions must be undertaken whenever they are justified.

The form, scale, and duration of any such protective action or remedial action must be optimised so as to produce the maximum net benefit, understood in a broad sense, under the prevailing social and economic circumstances.

Responsible persons must be accountable for the development, maintenance and implementation of emergency plans and establishing remedial action plans for chronic radiation exposures.¹⁰ Emergency plans should be consistent with the principles and requirements in the IAEA's *Preparedness and Response for a Nuclear or Radiological Emergency*, Safety Standards Series No. GS-R-2, 2002.

6.2 Application

Intervention actions (see section 2.2(f)) apply to emergency exposure situations requiring protective action to reduce or avert temporary radiation exposures, including:

- accidents and emergencies in which an emergency plan or emergency procedures have been activated; and
- any other temporary exposure situation identified by the Authority as warranting intervention.

Intervention actions also apply to chronic exposure situations requiring remedial action to reduce or avert chronic exposure, including:

- natural exposure, such as exposure to radon in buildings and workplaces;
- exposure to radioactive residues from past events, such as the radioactive contamination caused by accidents, after the situation requiring protective action has been terminated, as well as from the conduct of practices and the use of sources not under the system of notification, and authorization; and

¹⁰ Justification of protective or remedial actions is required as is optimisation of the levels at which actions are implemented. However, dose limits (see Schedule 1), which are intended to restrict the increases in exposure caused by practices, do not apply in the case of intervention to reduce existing exposures. Further, restrictions on the exposure of those taking part in the intervening action may need to be applied.

- any other chronic exposure situation specified by the Authority as warranting intervention.

[Note: it is anticipated that the new intervention recommendations would be referenced in this section in an appropriate way when completed]

7. Patient Discharge Recommendations

The Authority should advise hospitals and clinics treating patients with radioactive substances to establish procedures for the discharge of patients consistent with the provisions of RPS 4, *Recommendations for the Discharge of Patients Undergoing Treatment with Radioactive Substances* (ARPANSA 2002).

Schedule 1 - Dose Limits

Application	Dose Limits ¹	
	Occupational	Public
Effective Dose	20 mSv per year, averaged over a period of 5 consecutive calendar years ²	1 mSv in a year ⁴
Annual equivalent dose:		
the lens of the eye	150 mSv	15 mSv
the skin ⁵	500 mSv	50 mSv
the hands and feet	500 mSv	-

- 1 The limits shall apply to the sum of the relevant doses from external exposure in the specified period and the 50-year committed dose (to age 70 years for children) from intakes in the same period.
- 2 With the further provision that the effective dose shall not exceed 50 mSv in any single year. In addition, when a pregnancy is declared by a female employee, the embryo or fetus should be afforded the same level of protection as required for members of the public.
- 3 (DELETED)
- 4 In special circumstances, a higher value of effective dose could be allowed in a single year, provided that the average over 5 years does not exceed 1 mSv per year.
- 5 The equivalent dose limit for the skin applies to the dose averaged over any 1 cm² area of skin, regardless of the total area exposed.

NOTE 1: The above dose limits table has been directly extracted from ARPANSA's *Recommendations for limiting exposure to ionizing radiation (1995)*, [republished as RPS 1 in 2002]. However, as the RHC now advises that the exceptional circumstances clause is not recommended for use in Australia, note 3 of the table in RPS 1 has been deleted from this Directory.

NOTE 2: Exposure to radiation from natural sources is generally excluded from occupational or public exposure, except when the exposure is a direct consequence of a practice or is specifically identified by the appropriate authority as requiring control through the implementation of a program of radiation protection. Medical exposure includes doses received by patients undergoing medical diagnosis or therapy, doses received by volunteers in medical research, and doses received knowingly and willingly by persons other than health care workers as a consequence of their proximity to an exposed patient. Dose limits do not apply to exposures from natural sources, except as described above, or to medical exposures.

Schedule 2 – Classes of Non-ionizing Radiation

The Radiation Health Committee will progressively add to this Schedule the classes of non-ionizing radiation that are agreed to need a regulatory approach.

Schedule 3 - Exemption Levels

Exempt activity concentrations and exempt activities of radionuclides¹¹

Nuclide	Activity concentration (Bq/g)	Activity (Bq)	Nuclide	Activity concentration (Bq/g)	Activity (Bq)
H-3 (tritiated compounds, including OBT)	1×10^6	1×10^9	Sc-48	1×10^1	1×10^5
H-3 (elemental)	1×10^6	1×10^9	V-48	1×10^1	1×10^5
Be-7	1×10^3	1×10^7	Cr-51	1×10^3	1×10^7
C-11	1×10^1	1×10^6	Mn-51	1×10^1	1×10^5
C-14	1×10^4	1×10^7	Mn-52	1×10^1	1×10^5
N-13	1×10^2	1×10^9	Mn-52m	1×10^1	1×10^5
O-15	1×10^2	1×10^9	Mn-53	1×10^4	1×10^9
F-18	1×10^1	1×10^6	Mn-54	1×10^1	1×10^6
Na-22	1×10^1	1×10^6	Mn-56	1×10^1	1×10^5
Na-24	1×10^1	1×10^5	Fe-52	1×10^1	1×10^6
Mg-28	1×10^1	1×10^5	Fe-55	1×10^4	1×10^6
Si-31	1×10^3	1×10^6	Fe-59	1×10^1	1×10^6
P-32	1×10^3	1×10^5	Co-55	1×10^1	1×10^6
P-33	1×10^5	1×10^8	Co-56	1×10^1	1×10^5
S-35	1×10^5	1×10^8	Co-57	1×10^2	1×10^6
Cl-36	1×10^4	1×10^6	Co-58	1×10^1	1×10^6
Cl-38	1×10^1	1×10^5	Co-58m	1×10^4	1×10^7
Ar-37	1×10^6	1×10^8	Co-60	1×10^1	1×10^5
Ar-41	1×10^2	1×10^9	Co-60m	1×10^3	1×10^6
K-40	1×10^2	1×10^6	Co-61	1×10^2	1×10^6
K-42	1×10^2	1×10^6	Co-62m	1×10^1	1×10^5
K-43	1×10^1	1×10^6	Ni-59	1×10^4	1×10^8
Ca-45	1×10^4	1×10^7	Ni-63	1×10^5	1×10^8
Ca-47	1×10^1	1×10^6	Ni-65	1×10^1	1×10^6
Sc-46	1×10^1	1×10^6	Cu-64	1×10^2	1×10^6
Sc-47	1×10^2	1×10^6	Cu-67	1×10^2	1×10^6
			Zn-65	1×10^1	1×10^6

¹¹ This table is taken from the IAEA's International Basic Safety Standards for Protection Against Ionizing Radiation and for the Safety of Radiation sources, Safety Series 115 [IAEA 1996], and is supplemented from NRPB Report R306, Exempt Concentrations and Quantities for Radionuclides not Included in the European Basic Safety Standards Directive [NRPB 1999].

National Directory for Radiation Protection
SCHEDULE 3 – EXEMPTION LEVELS

Nuclide	Activity concentration (Bq/g)	Activity (Bq)	Nuclide	Activity concentration (Bq/g)	Activity (Bq)
Zn-69	1×10^4	1×10^6	Y-90	1×10^3	1×10^5
Zn-69m	1×10^2	1×10^6	Y-91	1×10^3	1×10^6
Ga-67	1×10^2	1×10^6	Y-91m	1×10^2	1×10^6
Ga-72	1×10^1	1×10^5	Y-92	1×10^2	1×10^5
Ge-68	1×10^1	1×10^5	Y-93	1×10^2	1×10^5
Ge-71	1×10^4	1×10^8	Zr-93 ^a	1×10^3	1×10^7
As-73	1×10^3	1×10^7	Zr-95	1×10^1	1×10^6
As-74	1×10^1	1×10^6	Zr-97 ^a	1×10^1	1×10^5
As-76	1×10^2	1×10^5	Nb-93m	1×10^4	1×10^7
As-77	1×10^3	1×10^6	Nb-94	1×10^1	1×10^6
Se-73	1×10^1	1×10^6	Nb-95	1×10^1	1×10^6
Se-75	1×10^2	1×10^6	Nb-97	1×10^1	1×10^6
Br-75	1×10^1	1×10^6	Nb-98	1×10^1	1×10^5
Br-76	1×10^1	1×10^5	Mo-90	1×10^1	1×10^6
Br-82	1×10^1	1×10^6	Mo-93	1×10^3	1×10^8
Kr-74	1×10^2	1×10^9	Mo-99	1×10^2	1×10^6
Kr-76	1×10^2	1×10^9	Mo-101	1×10^1	1×10^6
Kr-77	1×10^2	1×10^9	Tc-95m	1×10^1	1×10^6
Kr-79	1×10^3	1×10^5	Tc-96	1×10^1	1×10^6
Kr-81	1×10^4	1×10^7	Tc-96m	1×10^3	1×10^7
Kr-83m	1×10^5	1×10^{12}	Tc-97	1×10^3	1×10^8
Kr-85	1×10^5	1×10^4	Tc-97m	1×10^3	1×10^7
Kr-85m	1×10^3	1×10^{10}	Tc-99	1×10^4	1×10^7
Kr-87	1×10^2	1×10^9	Tc-99m	1×10^2	1×10^7
Kr-88	1×10^2	1×10^9	Ru-97	1×10^2	1×10^7
Rb-81	1×10^1	1×10^6	Ru-103	1×10^2	1×10^6
Rb-86	1×10^2	1×10^5	Ru-105	1×10^1	1×10^6
Sr-85	1×10^2	1×10^6	Ru-106 ^a	1×10^2	1×10^5
Sr-85m	1×10^2	1×10^7	Rh-103m	1×10^4	1×10^8
Sr-87m	1×10^2	1×10^6	Rh-105	1×10^2	1×10^7
Sr-89	1×10^3	1×10^6	Pd-103	1×10^3	1×10^8
Sr-90 ^a	1×10^2	1×10^4	Pd-109	1×10^3	1×10^6
Sr-91	1×10^1	1×10^5	Ag-105	1×10^2	1×10^6
Sr-92	1×10^1	1×10^6	Ag-108m	1×10^1	1×10^6
Y-88	1×10^1	1×10^6	Ag-110m	1×10^1	1×10^6

Nuclide	Activity concentration (Bq/g)	Activity (Bq)	Nuclide	Activity concentration (Bq/g)	Activity (Bq)
Ag-111	1×10^3	1×10^6	I-133	1×10^1	1×10^6
Cd-109	1×10^4	1×10^6	I-134	1×10^1	1×10^5
Cd-115	1×10^2	1×10^6	I-135	1×10^1	1×10^6
Cd-115m	1×10^3	1×10^6	Xe-131m	1×10^4	1×10^4
In-111	1×10^2	1×10^6	Xe-133	1×10^3	1×10^4
In-113m	1×10^2	1×10^6	Xe-135	1×10^3	1×10^{10}
In-114m	1×10^2	1×10^6	Cs-129	1×10^2	1×10^5
In-115m	1×10^2	1×10^6	Cs-131	1×10^3	1×10^6
Sn-113	1×10^3	1×10^7	Cs-132	1×10^1	1×10^5
Sn-117m	1×10^2	1×10^6	Cs-134m	1×10^3	1×10^5
Sn-121	1×10^5	1×10^7	Cs-134	1×10^1	1×10^4
Sn-125	1×10^2	1×10^5	Cs-135	1×10^4	1×10^7
Sb-122	1×10^2	1×10^4	Cs-136	1×10^1	1×10^5
Sb-124	1×10^1	1×10^6	Cs-137 ^a	1×10^1	1×10^4
Sb-125	1×10^2	1×10^6	Cs-138	1×10^1	1×10^4
Te-123m	1×10^2	1×10^7	Ba-131	1×10^2	1×10^6
Te-125m	1×10^3	1×10^7	Ba-133	1×10^2	1×10^6
Te-127	1×10^3	1×10^6	Ba-140 ^a	1×10^1	1×10^5
Te-127m	1×10^3	1×10^7	La-140	1×10^1	1×10^5
Te-129	1×10^2	1×10^6	Ce-139	1×10^2	1×10^6
Te-129m	1×10^3	1×10^6	Ce-141	1×10^2	1×10^7
Te-131	1×10^2	1×10^5	Ce-143	1×10^2	1×10^6
Te-131m	1×10^1	1×10^6	Ce-144 ^a	1×10^2	1×10^5
Te-132	1×10^2	1×10^7	Pr-142	1×10^2	1×10^5
Te-133	1×10^1	1×10^5	Pr-143	1×10^4	1×10^6
Te-133m	1×10^1	1×10^5	Nd-147	1×10^2	1×10^6
Te-134	1×10^1	1×10^6	Nd-149	1×10^2	1×10^6
I-123	1×10^2	1×10^7	Pm-147	1×10^4	1×10^7
I-124	1×10^1	1×10^6	Pm-149	1×10^3	1×10^6
I-125	1×10^3	1×10^6	Sm-147	1×10^1	1×10^4
I-126	1×10^2	1×10^6	Sm-151	1×10^4	1×10^8
I-129	1×10^2	1×10^5	Sm-153	1×10^2	1×10^6
I-130	1×10^1	1×10^6	Eu-152	1×10^1	1×10^6
I-131	1×10^2	1×10^6	Eu-152m	1×10^2	1×10^6
I-132	1×10^1	1×10^5	Eu-154	1×10^1	1×10^6

Nuclide	Activity concentration (Bq/g)	Activity (Bq)	Nuclide	Activity concentration (Bq/g)	Activity (Bq)
Eu-155	1×10^2	1×10^7	Au-198	1×10^2	1×10^6
Gd-153	1×10^2	1×10^7	Au-199	1×10^2	1×10^6
Gd-159	1×10^3	1×10^6	Hg-195m	1×10^2	1×10^6
Tb-160	1×10^1	1×10^6	Hg-197	1×10^2	1×10^7
Dy-165	1×10^3	1×10^6	Hg-197m	1×10^2	1×10^6
Dy-166	1×10^3	1×10^6	Hg-203	1×10^2	1×10^5
Ho-166	1×10^3	1×10^5	Tl-200	1×10^1	1×10^6
Ho-166m	1×10^1	1×10^6	Tl-201	1×10^2	1×10^6
Er-161	1×10^1	1×10^6	Tl-202	1×10^2	1×10^6
Er-169	1×10^4	1×10^7	Tl-204	1×10^4	1×10^4
Er-171	1×10^2	1×10^6	Pb-203	1×10^2	1×10^6
Tm-170	1×10^3	1×10^6	Pb-210 ^a	1×10^1	1×10^4
Tm-171	1×10^4	1×10^8	Pb-212 ^a	1×10^1	1×10^5
Yb-169	1×10^2	1×10^7	Bi-206	1×10^1	1×10^5
Yb-175	1×10^3	1×10^7	Bi-207	1×10^1	1×10^6
Lu-177	1×10^3	1×10^7	Bi-210	1×10^3	1×10^6
Hf-181	1×10^1	1×10^6	Bi-212 ^a	1×10^1	1×10^5
Ta-182	1×10^1	1×10^4	Bi-213	1×10^2	1×10^6
W-181	1×10^3	1×10^7	Po-203	1×10^1	1×10^6
W-185	1×10^4	1×10^7	Po-205	1×10^1	1×10^6
W-187	1×10^2	1×10^6	Po-207	1×10^1	1×10^6
W-188	1×10^2	1×10^5	Po-210	1×10^1	1×10^4
Re-186	1×10^3	1×10^6	At-211	1×10^3	1×10^7
Re-188	1×10^2	1×10^5	Rn-220 ^a	1×10^4	1×10^7
Os-185	1×10^1	1×10^6	Rn-222 ^a	1×10^1	1×10^8
Os-191	1×10^2	1×10^7	Ra-223 ^a	1×10^2	1×10^5
Os-191m	1×10^3	1×10^7	Ra-224 ^a	1×10^1	1×10^5
Os-193	1×10^2	1×10^6	Ra-225	1×10^2	1×10^5
Ir-190	1×10^1	1×10^6	Ra-226 ^a	1×10^1	1×10^4
Ir-192	1×10^1	1×10^4	Ra-227	1×10^2	1×10^6
Ir-194	1×10^2	1×10^5	Ra-228 ^a	1×10^1	1×10^5
Pt-191	1×10^2	1×10^6	Ac-225	1×10^1	1×10^4
Pt-193m	1×10^3	1×10^7	Ac-227	1×10^{-1}	1×10^3
Pt-197	1×10^3	1×10^6	Ac-228	1×10^1	1×10^6
Pt-197m	1×10^2	1×10^6	Th-226 ^a	1×10^3	1×10^7

Nuclide	Activity concentration (Bq/g)	Activity (Bq)	Nuclide	Activity concentration (Bq/g)	Activity (Bq)
Th-227	1×10^1	1×10^4	Pu-242	1×10^0	1×10^4
Th-228 ^a	1×10^0	1×10^4	Pu-243	1×10^3	1×10^7
Th-229 ^a	1×10^0	1×10^3	Pu-244	1×10^0	1×10^4
Th-230	1×10^0	1×10^4	Am -241	1×10^0	1×10^4
Th-231	1×10^3	1×10^7	Am-242	1×10^3	1×10^6
Th-nat (incl Th-232)	1×10^0	1×10^3	Am-242m ^a	1×10^0	1×10^4
Th-234 ^a	1×10^3	1×10^5	Am-243 ^a	1×10^0	1×10^3
Pa-230	1×10^1	1×10^6	Cm-242	1×10^2	1×10^5
Pa-231	1×10^0	1×10^3	Cm-243	1×10^0	1×10^4
Pa-233	1×10^2	1×10^7	Cm-244	1×10^1	1×10^4
U-230 ^a	1×10^1	1×10^5	Cm-245	1×10^0	1×10^3
U-231	1×10^2	1×10^7	Cm-246	1×10^0	1×10^3
U-232 ^a	1×10^0	1×10^3	Cm-247	1×10^0	1×10^4
U-233	1×10^1	1×10^4	Cm-248	1×10^0	1×10^3
U-234	1×10^1	1×10^4	Bk-249	1×10^3	1×10^6
U-235 ^a	1×10^1	1×10^4	Cf-246	1×10^3	1×10^6
U-236	1×10^1	1×10^4	Cf-248	1×10^1	1×10^4
U-237	1×10^2	1×10^6	Cf-249	1×10^0	1×10^3
U-238 ^a	1×10^1	1×10^4	Cf-250	1×10^1	1×10^4
U-nat	1×10^0	1×10^3	Cf-251	1×10^0	1×10^3
U-239	1×10^2	1×10^6	Cf-252	1×10^1	1×10^4
U-240	1×10^3	1×10^7	Cf-253	1×10^2	1×10^5
U-240 ^a	1×10^1	1×10^6	Cf-254	1×10^0	1×10^3
Np-237 ^a	1×10^0	1×10^3	Es-253	1×10^2	1×10^5
Np-239	1×10^2	1×10^7	Es-254	1×10^1	1×10^4
Np-240	1×10^1	1×10^6	Es-254m	1×10^2	1×10^6
Pu-234	1×10^2	1×10^7	Fm-254	1×10^4	1×10^7
Pu-235	1×10^2	1×10^7	Fm-255	1×10^3	1×10^6
Pu-236	1×10^1	1×10^4	Alpha-emitting radionuclide not mentioned in this Table	1×10^0	1×10^3
Pu-237	1×10^3	1×10^7	Radionuclide that is not alpha-emitting and not mentioned in this Table	1×10^1	1×10^4
Pu-238	1×10^0	1×10^4			
Pu-239	1×10^0	1×10^4			
Pu-240	1×10^0	1×10^3			
Pu-241	1×10^2	1×10^5			

^a Parent nuclides and their progeny included in secular equilibrium are listed in the following:

Sr-80	Rb-80
Sr-90	Y-90
Zr-93	Nb-93m
Zr-97	Nb-97
Ru-106	Rh-106
Ag-108m	Ag-108
Cs-137	Ba-137m
Ce-134	La-134
Ce-144	Pr-144
Ba-140	La-140
Bi-212	Tl-208 (0.36), Po-212 (0.64)
Bi-212	Tl-208 (0.36), Po-212 (0.64)
Pb-210	Bi-210, Po-210
Pb-212	Bi-212, Tl-208 (0.36), Po-212 (0.64)
Rn-220	Po-216
Rn-222	Po-218, Pb-214, Bi-214, Po-214
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Tl-207
Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Ra-226	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Ra-228	Ac-228
Th-226	Ra-222, Rn-218, Po-214
Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-229	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209
Th-nat	Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-234	Pa-234m
U-230	Th-226, Ra-222, Rn-218, Po-214
U-232	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
U-235	Th-231
U-238	Th-234, Pa-234m
U-nat	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210

U-240	Np-240m
Np-237	Pa-233
Am-242m	Am-242
Am-243	Np-239

NOTE 2: The limits in relation to U(nat) and Th(nat) are to be applied in terms of the parent radionuclide ie. U-238 and Th-232 respectively.

Schedule 4 - Competency Requirements for Authorisation to Use Radiation Sources for Specified Practices

This schedule specifies the agreed competencies and/or pre-requisites for obtaining authorisations to use radiation sources for specified practices.

S 4.1 - Use of X-ray equipment by chiropractors for plain film diagnostic radiography of the spine and pelvis¹²

Must provide evidence of the following:

- Current registration as a chiropractor in the relevant jurisdiction; and one of the following:
 - graduates in Chiropractic from RMIT University, Bundoora, Victoria (or forerunner Phillip Institute of Technology)
 - graduates in chiropractic from Macquarie University, NSW (or forerunner Sydney College of Chiropractic, Ashfield, Sydney, NSW since 30 Nov 1983)
 - For overseas trained chiropractors, one of the following:
 - Satisfactory assessment by RMIT University or Macquarie University
 - Individual Assessment by the relevant State/Territory Authority against a protocol agreed by the Radiation Health Committee

S 4.2 - Use of intra-oral X-ray equipment by dentists for radiography of teeth and facial bones¹³

Must provide evidence of the following:

- Current registration by the relevant Dental Board

S 4.3 - Use of intra-oral X-ray equipment by dental hygienists for dental radiography

Must provide evidence of the following:

- Current registration as a dental hygienist by the relevant Dental Board; and one of the following:
 - Diploma of Dental Hygiene from Oral Health Centre of WA or Torrens Valley College of TAFE (Gilles Plains SA)
 - For Overseas trained dental hygienists, satisfactory assessment from Oral Health Centre of WA or Torrens Valley College of TAFE (Gilles Plains SA)

S 4.4 - Use of intra-oral X-ray equipment by dental therapists for dental radiography

Must provide evidence of the following:

- Current registration as a dental therapist by the relevant Dental Board, and satisfactory assessment at course in dental therapy accredited by the Authority.

S 4.5 - Use of X-ray equipment by diagnostic radiographers for diagnostic radiography

Must provide evidence of one of the following:

- AIR Statement of Accreditation (AIR Stat Accred)
- Certificate of Competence issued by the Conjoint Board of the RACR and the AIR

¹² Nationally agreed requirements for radiography of extremities will be included in a later edition of the Directory.

¹³ Nationally agreed requirements for OPG, and for radiography of hand & wrist for bone age, will be included in a later edition of the Directory.

- Diploma of Qualification issued by the Conjoint Board of the RACR and the AIR
- 1984 Assoc. Diploma in Diagnostic Radiography Graduates from Sydney TAFE

Persons undertaking the Professional Development Year (PDY) at an accredited institution or practice must provide evidence of the following to obtain a restricted authorisation:

- AIR Provisional Statement of Accreditation

S 4.6 - Use of radiation equipment by radiation therapists for radiation therapy

Must provide evidence of one of the following:

- AIR Statement of Accreditation in therapeutic radiography (AIR Stat Accred)
- Certificate of Competence in therapeutic radiography issued by the Conjoint Board of the RACR and the AIR
- Diploma of Qualification in therapeutic radiography issued by the Conjoint Board of the RACR and the AIR

Persons undertaking the Professional Development Year (PDY) at an accredited institution or practice must provide evidence of the following to obtain a restricted authorisation:

- AIR Provisional Statement of Accreditation

S 4.7 - Use of radioactive materials by nuclear medicine technologists for nuclear medicine purposes

Must provide evidence of the following:

- Statement of Accreditation by ANZSNM

Persons undertaking the Professional Development Year (PDY) at an accredited institution or practice must provide evidence of the following to obtain a restricted authorisation:

- Provisional Statement of Accreditation from ANZSNM

S 4.8 - Use of radiation sources by veterinary surgeons for veterinary purposes

Must provide evidence of the following:

- Diagnostic X-ray equipment use for small animal radiography¹⁴:
 - Current registration by the relevant Veterinary Board.
- Sealed radioactive source use:
 - Current registration by the relevant Veterinary Board, and satisfactory completion of an accredited examination on the principles and practices of radiation protection in the proposed use of radioactive materials.
- Unsealed radioactive source use:
 - Current registration by the relevant Veterinary Board, and satisfactory completion of an accredited examination on the principles and practices of radiation protection in the proposed use of radioactive materials.

¹⁴ Requirements for large animal radiography and therapy use of X-ray equipment will be considered in a future edition of the Directory.

Schedule 5 – Requirements for Licensing Practices

Requirements for Bore Hole Logging or Well Logging

1. The licence must include a purpose statement that restricts the licensee to the use of registered radioactive sources or radiation apparatus for bore hole logging or well logging only.
2. The licence must require the licensee to comply with the *ARPANSA/NOHSC Standard for limiting occupational exposure to ionizing radiation RPS1 (2002)*.
3. The licence must require the licensee to comply with the *Code of practice for the safe use of sealed radioactive sources in borehole logging (1989) [RHS 28]*.
4. The licence must require the licensee to supervise any field site while radioactive sources or radiation apparatus are in use, to ensure that unauthorised persons do not enter the site.

Requirements for Industrial Radiography

1. The licence must include a purpose statement that restricts the licensee to the use of registered radioactive sources or radiation apparatus for industrial radiography only.
2. The licence must require the licensee to comply with the *ARPANSA/NOHSC Standard for limiting occupational exposure to ionizing radiation RPS1 (2002)*.
3. The licence must require the licensee to ensure that all practices involving industrial radiography ionizing radiation sources are conducted in compliance with the *Code of practice for the safe use of industrial radiography equipment (1989) [RHS 31]*.
4. The licence must require the licensee to undertake continuous and immediate personal supervision of any assistant using industrial radiography apparatus.
5. The licence must prohibit the licensee from using industrial radiography ionizing radiation apparatus if the working conditions are likely to render radiation-warning devices ineffective.
6. The licence must require the licensee to ensure that a beam stop is used when performing warm up operations on industrial radiography X-ray apparatus or when energising the X-ray tube for any purpose other than the production of a radiographic image.
7. The licence must require the licensee to ensure that:
 - (a) unless otherwise approved in writing by the Authority, the source is disposed of by returning it to the supplier at the end of its useful life;
 - (b) where a radioactive source is being used for industrial radiography at an area other than the place where it is usually stored, diagrams or photographs with dimensions and identifying features of the source and the steps to be taken by any person finding such a source are immediately available at the area where the source is being used.

Schedule 6 - Nationally Agreed Security Requirements for persons applying for authorisation to possess, store or use a radiation source

A future version of this Directory will specify in this Schedule the agreed security requirements for persons to be authorised to possess, store or use radiation sources of specified categories.

Schedule 7 - Criteria for Registration of Radiation Sources and Premises

Registration criteria for Industrial Radiography Sealed Sources and Premises

1. All source capsules used for industrial radiography must:
 - (a) be designed and constructed to so that any radioactive material must remain effectively enclosed within the capsule during normal use and accident conditions;
 - (b) for the purposes of section (a), a capsule complies if it meets the requirements of ISO 2919:1999 (E), as expressed in table 4 of that Standard;
 - (c) have current special form certification;
2. All source containers used for industrial radiography, other than those for X-ray crawler control sources, must:
 - (a) comply with the *Code of Practice for the Safe Use of Industrial Radiography Equipment* (1989) [RHS 31]; and
 - (b) have current Type B(U) certification, the requirements for which are specified in the *Code of Practice for the Transport of Radioactive Material* (2001) [RPS2], or be transported in the relevant approved overpack.
3. The premises constituting the principal place of storage of sources used for industrial radiography must comply with the *Code of Practice for the Safe Use of Industrial Radiography Equipment* (1989) [RHS 31].

Schedule 8 - Minimum Set of Nationally Agreed Accreditation Requirements for Third-Party Service Providers

A future version of this Directory will specify in this Schedule categories of accreditations, standard requirements for accreditation and personnel security checks, national accreditation processes and guidelines and functions suitable for outsourcing by an Authority to a third-party service provider.

Schedule 9 - National Adoption of Referenced Codes of Practice and Standards

The following Codes of Practice and Standards are referenced:

RPS 1 (Recommendations and National Standard)	<i>Recommendations for Limiting Exposure to Ionizing Radiation</i> (1995) and <i>National Standard for Limiting Occupational Exposure to Ionizing Radiation</i> (1995), NOHSC/ARPANSA, republished in March 2002.
RPS 2 Code of Practice	<i>Safe Transport of Radioactive Material</i> , ARPANSA, September 2001
RPS 3 Radiation Protection Standard	Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz, ARPANSA, May 2002.

NOTES:

Codes of Practice and Standards previously published by the NHMRC in its the Radiation Health Series publications have been handed over to ARPANSA for review and re-publication in ARPANSA's Radiation Protection Series (RPS). The RHC will progressively review RHS publications and promulgate the new publications in the RPS series.

Many Codes and Standards in the RHS series have been adopted by one or more Australian jurisdictions either in their regulations or as conditions of licence. The status of the RHS documents and other standards in the various jurisdictions is tabulated in Annex 3.

Schedule 10 - National adoption of extracts from Codes of Practice and Standards

The RHC will, progressively over time, agree on extracts that may be adopted by an Authority in its legislative framework and include such agreed extracts in future versions of this Directory.

Schedule 11 - National incident reporting framework

This Schedule specifies the types of incidents that must be reported to ARPANSA for compilation in the Australian Radiation Incidents Register.

DEFINITIONS

Radiation Incident

Any unintended or ill-advised event when using ionizing radiation apparatus, specified types of non-ionizing radiation apparatus or radioactive substances, which results in, or has the potential to result in, an exposure to radiation to any person or the environment, outside the range of that normally expected for a particular practice, including events resulting from operator error, equipment failure, or the failure of management systems that warranted investigation.

TYPES OF INCIDENT TO BE REPORTED TO THE REGISTER

For guidance, the following types of incidents must be specifically included in the Register.

1. *Incidents that cause or may lead to radiation injuries or radiation doses exceeding the annual dose limits to workers or members of the public*

Note that situations where radiation injuries or high doses [exceeding 0.25 Sv whole body, 0.75 Gy organ dose, 2-3 Gy skin dose] require international reporting to IAEA, and should be reported to the ARIR as soon as possible, and within 24 hours.

2. *Medical exposure of patients*

- (a) When during the administration of a radioactive substance for diagnostic purposes, the activity of the substance administered exceeds the activity prescribed in the hospital/practice standard protocol for that test by 50% or more;
- (b) When during the administration of a radioactive substance for therapeutic purposes, the activity administered differs from that prescribed by 15% or more;
- (c) When during administration of a therapeutic dose of radiation from a radiation apparatus or a sealed radioactive source, the dose delivered differs from the total prescribed treatment dose by more than 10%;
- (d) Any therapeutic treatment delivered to either the wrong patient or the wrong tissue, or using the wrong radiopharmaceutical;
- (e) Any diagnostic procedure other than as prescribed by the medical practitioner;
- (f) Any diagnostic procedure resulting in an observable acute radiation effect.

3. *Lost or Stolen Radioactive Sources or Radiation Apparatus*

4. *Transport of Radioactive Material*

- (a) Where a package is damaged during freight handling or transport;

(b) Where a package is transported without the required documentation, placarding or labelling;

5. Unintentional or Unauthorised Discharges of Radioactive Materials into the Environment

Reporting is required when the activity discharged exceeds 100 times the exemption limit for that radionuclide specified in Schedule 3 of this Directory.

6. Damage to, or Malfunctioning of, a Radiation Apparatus or Sealed Source Apparatus

Reporting is required where the damage or malfunction could in any way affect the radiation safety of the apparatus, including issues such as shielding integrity or causing increased radiation levels.

7. Contamination with, or Dispersal of, a Radioactive Material

Reporting is required where a surface, substance or material is contaminated by a radioactive substance resulting from the spillage of more than 100 times the exempt quantity of that substance specified in Schedule 3 of this Directory.

8. Out of Control Source of Radiation

Reporting is required for situations where a radiation source is out of control. Out of control means, for example, that the source is not safely secured or shielded, or contamination is not confined.

9. Non-ionizing Radiation

Reporting is required for occurrences where there is actual injury, or the potential for injury, as a result of operator error, damage or malfunction of equipment, or failure of management systems, for the types of non-ionizing radiation equipment specified below:

- (i) lasers;
- (ii) radiofrequency generating equipment;
- (iii) man-made sources of ultraviolet radiation;
- (iv) magnetic resonance imaging machines.

10. Nuclear Incidents

Reporting is required for events such as criticality incidents or events related to the safety of a nuclear reactor or nuclear processing plant.

11. Other incidents that the Authority considers warrant reporting

This could include near-miss situations that should serve as a warning to other users. It could also include situations where radiation monitors at the entrance of scrap metal processing factories and landfill sites are triggered.

Clearly there will be some grey areas and judgements will have to be made in these cases.

Annex 1 - Process for Resolving a National Approach to Various Radiation Protection Issues¹⁵

Introduction

This paper describes a process for resolving the various issues which will arise as national uniformity of radiation protection frameworks is progressed. The shorthand reference to this process will be the 'process for issue resolution'.

Over time, a broad range of issues will be resolved through use of the process for issue resolution. In some cases, the outcome will be new national standards or codes of practice. As such, the process for issue resolution will need to mirror, as closely as possible, the existing processes for national standards setting which were prescribed by the Council of Australian Governments in the publication *Principles and Guidelines for National Standard Setting and Regulatory Action by Ministerial Councils and Standard-Setting Bodies* (the COAG Principles and Guidelines). That document effectively sets out the requirements for impact assessment where new regulation is proposed, including the steps to preparing a regulatory impact statement (RIS).

The approach to progressing national uniformity which has been agreed at officer level centres on the Radiation Health Committee (RHC), established under the Commonwealth's *Australian Radiation Protection and Nuclear Safety Act 1998* and serviced by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), developing a National Directory for Radiation Protection. The process for issue resolution, comprising research, consultation, and implementation, will need to be followed for each matter which will appear in the National Directory. Once the RHC has completed its deliberations on a particular issue, the proposed provisions will be submitted direct to Health Ministers (through AHMAC) for approval.

It is also expected that, where the process for issue resolution has been followed in resolving a particular issue, there will be a reduced need for individual jurisdictions to complete their own comprehensive regulation impact assessment prior to implementing agreed provisions of the National Directory. For example, comprehensive consultations will occur at the national level as provisions are being developed, perhaps requiring only a limited supplementary process in States and Territories. To achieve this aim, however, the process will need to meet not only the requirements laid down by the Council of Australian Governments' 'Principles and Guidelines for National Standard Setting and Regulatory Action by Ministerial Councils and Standard-Setting Bodies', but also regulation review requirements of all States and Territories. The process will be developed further until this objective has been achieved.

¹⁵ This Annex is a copy of the paper submitted to the 4 August 1999 Australian Health Ministers' Conference, and formed part of the Ministerial agreement to develop the National Directory for Radiation Protection.

Once the contents of the initial draft National Directory are resolved through use of the process for issue resolution, the draft National Directory will be used as a resource guiding all States, Territories and the Commonwealth to undertake nationally uniform legislative changes.

The National Directory will also change over time as further agreements are reached by the members of the RHC, and as additional scientific and other research becomes available about the health effects of radiation.

General description of the process for issue resolution

The various elements of the process for issue resolution are discussed below. Naturally, the process is intended to be flexible and it is expected that some of these steps may be dispensed with, or combined, in any particular case. Likewise, timeframes for completion of the process will depend on the complexity of the particular issue at hand.

The key objectives of the process for issue resolution are to ensure that:

- a range of options is considered;
- comprehensive consultation is undertaken, and the results are recorded and considered; and
- there are visible ‘signposts’ which indicate how a particular decision was reached.

It is worth noting that the COAG Principles and Guidelines outline various techniques which may be used as part of an RIS framework. Some of the available techniques include cost effectiveness analysis and risk assessment. The particular issue at hand will largely determine which of these techniques is most appropriate.

Issue identification

The process for issue resolution is initiated when an issue is brought to the attention of the RHC of ARPANSA. Some understanding will need to be developed between jurisdictions to ensure that the RHC is given an opportunity to discuss issues which have a national dimension. If possible, unilateral action by any jurisdiction where that action will detract from uniformity should be avoided.

An issue may be raised by a range of interested parties, including:

- the CEO of ARPANSA;
- a member of the RHC;
- a member of the Radiation Health and Safety Advisory Council (RHSAC) of ARPANSA; or
- an outside stakeholder such as another State or Commonwealth agency (eg Workcover) or a professional peak organisation, for example the Australian Institute of Non-Destructive Testing [in this case the approach would be made in writing to the CEO].

Regulations under the ARPANS Act will prescribe in general terms the roles and functions of the RHSAC and various Committees. However, it is anticipated that these arrangements will give the RHC some discretion to decide how a particular issue should be dealt with. The options here may include:

- Direct resolution of an issue by the RHC;
- A recommendation to the RHSAC that it address a particular issue;
- The co-operative resolution of an issue through discussions and correspondence with outside agencies and other stakeholders [co-ordinated by the CEO];
- Combining the ‘new’ issue with other issues already being discussed; or
- A decision that an issue raised does not require further investigation.

Several broad types of issues for resolution may be identified at this point. Many issues will be primarily ‘scientific’ in nature, such as the definition of a radioactive substance or the content of a Code of Practice. Other issues will be primarily ‘regulatory’ in nature, such as reaching an agreed position on how a particular occupation or professional group should be regulated across all jurisdictions, or creating a policy for the use of accredited private sector inspectors/auditors (and the criteria for their accreditation). Both types of issues are likely to require impact assessment.

As a matter of policy, the issue to be resolved should be identified in a broad sense. This will allow a range of perspectives to be considered as part of the process for issue resolution. This in turn will help to ensure that the best decision is made. An example would be ‘Ensure radiographic services in remote areas are operated to a high radiation safety standard.’

Working group

Once the RHC has resolved to take action, a Working Group will be formed to oversee the process for issue resolution.

Composition of the Working Group will depend on the issue at hand. It will always comprise one or more members of the RHC, and will include other members as required. These other members may be representatives of stakeholders such as industry, professional groups or academic institutions. They may also be nominees of other Commonwealth or State/Territory agencies such as WorkSafe Australia.

While the formation of each Working Group will be issue-specific, it is anticipated that the resolution of each issue will generally require both scientific and legal/policy expertise. The members of each Working Group will be selected with this in mind. Other sources of available expertise will include members of the ARPANSA Secretariat and ARPANSA scientific, technical, policy and legal staff, as well as contractors.

At the outset, the Working Group will agree a workplan for completing a response to the particular issue. In deciding a workplan, it may be most appropriate for the Working Group to refer to the various techniques for impact assessment set out in the COAG Principles and Guidelines. In all cases, the workplan will include a deadline.

Development of a preferred position

The Working Group will undertake research on the issue for resolution, including examining work done previously in Australia and overseas. The Secretariat will provide assistance in this area. Working Group members will also discuss the issue with other RHC members.

As the process for issue resolution progresses, the Working Group will develop a 'preferred position'. That position should, where possible, be the outcome of consideration of a range of options. The process of looking at the relative impacts of different options to achieve the objective will allow the Working Group to identify the one with the greatest net benefit.

The development of a preferred position should take account of the 'features of good regulation' as identified in the COAG Principles and Guidelines. These include:

- Provisions should entail the minimum necessary regulation to achieve the objectives;
- Provisions should minimise, as much as possible, the financial impact of administration and enforcement on government and the affected sectors of the community;
- Provisions should be performance based, that is they should focus on outcomes rather than inputs; and
- Provisions should be drafted in 'plain language' so that their intent is clear.

The preferred position should be reached by consensus within the group.

Once developed and agreed, a 'preferred option' may be compared with the status quo, and other possible options, to provide some assessment of the impact of the proposed changes, including costs and benefits. This will ensure that the preferred position is the one with the greatest net benefit.

Consideration should also be given to what final form the provision should take. The majority of processes for issue resolution will conclude with an entry into the National Directory. However, beyond that point, a new Code of Practice may be required, or an amendment to an existing Code or Standard.

The development of a preferred position will also include consultation with the full RHC to ensure that the Committee is comfortable with the direction being taken by the Working Group.

Consultation

The consultation process undertaken by the Working Group will conform to the COAG Principles and Guidelines. Interested parties should be given a firm proposal to consider. This means that the preferred position should be developed to a point where the impacts are clear before consultation begins.

The level of consultation will correspond to the particular issue being discussed and, at the least, will include those most likely to be affected by regulations (eg business organisations and professional bodies). In most cases, however, it will

comprise full consultation with relevant stakeholders, including radiological advisory councils in most States and Territories.

Effective consultation at the national level will indicate the level of support for the proposal. In most cases, it will also provide valuable feedback on the costs and benefits of a proposed regulation.

The outcome of all consultations will be recorded by the Working Group and members of the Secretariat. At the conclusion of the process for issue resolution, details of the stakeholders consulted and their views on the preferred option (and other options) will be included in the final report.

Nationally agreed position

A nationally agreed position will be created when, following the consultation phase, the Working Group reports back to the whole RHC. This will take the form of a final written report.

Another important element in developing the nationally agreed position will be the technical advice provided by all members of the RHC in relation to implementation issues.

Once the Working Party's written report has been received, the RHC will provide that report to the CEO of ARPANSA and request that the Standards Development and Committee Support Section of ARPANSA prepare the necessary papers for consideration by Health Ministers (through AHMAC).

At this stage, the RHC may also recommend to the CEO that consideration be given to further action on the matter. For example, the RHC may recommend that work begin on a new Code of Practice or that an existing Code be revised.

Approval

Once the report has been provided to ARPANSA, the nationally agreed position will be considered to be a draft entry in the National Directory. It will remain a draft pending formal approval by Health Ministers.

Since AHMAC and Health Ministers meet only twice a year, they will be advised on several issues at each meeting. Those briefings will comprise detailed information on 'complex' issues, for example those connected with the professions, and shorter summaries of agreements on more 'routine' matters such as new definitions. Other business related to the Directory may be completed on an out-of-session basis.

Once approved by Health Ministers, the provision will become a 'final' entry in the National Directory and will be used by jurisdictions undertaking legislative changes. It may also be further developed to become a new Code of Practice, or a Standard, or a Guidance Note.

Implementation

After Health Ministers have approved the agreed position, the provision will be available to guide legislative amendments in each jurisdiction.

Other details of the implementation process, including the degree of flexibility available to jurisdictions in implementing provisions of the National Directory, may be a matter for negotiations between the Commonwealth and the States and Territories.

Annex 2 - Derivation of Exemption Levels for Regulatory Purposes

Introduction

The definition of radioactive material and the levels used to define exemption from regulatory control in legislation and regulations throughout Australia vary considerably between jurisdictions. These differences have been historical in origin as regulations have changed at different times and local issues such as mining in some jurisdictions have also influenced the definitions used. In some cases legislation has defined what is radioactive and in other jurisdictions the definition has been in terms of what is exempt from legislation. The differences between definitions can cause difficulties where a material defined as radioactive in one jurisdiction is unregulated in another. There have also been changes in radiation protection philosophy and practice introduced following the publishing of International Commission on Radiological Protection publication 60. These have included the adoption of Australian ARPANSA/NOHSC recommendations and National Standard, revised ICRP kinetic and dosimetric model of the respiratory tract, new dose coefficients for workers using this model (ICRP 68), and revised IAEA Basic Safety Standards which include a new system for exempting radioactive materials from regulatory control. The IAEA has also recently revised its transport regulations and adopted the dose criteria used in the Basic Safety Standards.

Consequently a need for a uniform definition of radioactive material and exemption limits for regulatory purposes has been identified and this guideline has been developed for this purpose.

Principles & Methods

In order to develop a uniform Australian approach to the definition of radioactive material a review was undertaken of existing approaches both in Australia and overseas. As a result a generalised definition of radioactive material has been adopted in conjunction with exemption levels based on IAEA Safety Series No. 115. IAEA adopts a system of activity and activity concentration levels for each radionuclide rather than a single overall figure. The IAEA approach has also been adopted by the European Communities.

IAEA established general principles for exemption from regulatory control in Safety Series No. 89 (1988). Broadly, they are:

- (a) the radiation risks to individuals should be sufficiently low as to be of no regulatory concern;
- (b) radiation protection, including the cost of regulatory control, must be optimised.

The individual risk is addressed by defining a level of dose that can be regarded as 'trivial'. Two approaches were adopted in Safety Series No. 89. A level of risk (and the corresponding dose) was chosen that could be considered to be of no significance to individuals. Exposure to natural background radiation was used as a reference level, as it is both normal and unavoidable.

Safety Series No. 89 concluded that for the purposes of exemption from regulations, a level of dose of some tens of μSv in a year could reasonably be regarded as trivial. Since an individual may be exposed to radiation from several exempt sources, it is necessary to ensure that the total dose from exempt sources does not exceed the trivial dose level. Accordingly, it was recommended that the critical group dose from any one exempt source should be of the order of $10 \mu\text{Sv}$ per year. This level was used in the IAEA International Basic Safety Standards and has been adopted in this guideline.

The IAEA International Basic Safety Standards calculated individual exemption levels for 299 radionuclides, of which 103 were found to have current or conceivable uses. Six physical forms were considered to cover the existing range of use: gas/vapour, liquid/solution, dispersible solid (eg powder), non-dispersible solid, thin film/foil, and sealed source/capsule. The exemption level given for each radionuclide was that for the most restrictive form. Short-lived radionuclide daughters were included with the parent where they would be expected to be in equilibrium over the period of use and/or disposal. Two extra cases were considered: naturally occurring materials where all radionuclides in (i) ^{238}U and (ii) ^{232}Th decay chains would be in equilibrium.

The IAEA exemption levels were derived using a methodology given in the EC report Radiological Protection 65 and resulted from taking the most limiting case for potential exposure from workplace and public exposure scenarios. Three basic scenarios were considered: normal use, accidental exposure and disposal. Each results in doses from one or more of three exposure pathways: ingestion, inhalation and external exposure. A total dose for each scenario was calculated by summing across the pathways. Since it is unlikely that an individual will be significantly exposed via more than one pathway at any time, this is clearly a conservative assumption. The scenarios and pathways used are listed in Table I.

There were no scenarios covering accidents in the workplace used in calculating exempt concentrations; it was considered that the scenarios developed for normal use and the associated dose criterion, $10 \mu\text{Sv y}^{-1}$, ensured an adequate of protection in the case of possible accidents. The methodology is further outlined in the block diagrams, Figures 1,2 & 3.

There is one other issue with the application of the exemption values: the quantity of material involved. The radionuclide-specific concentration levels for exemption were calculated on the basis of small to moderate amounts of materials. This is mainly an issue in the external exposure scenario that assumes a source size of 1 m^3 . Clearly, if a larger volume of radioactive material was assumed, doses higher than $10 \mu\text{Sv y}^{-1}$ would be estimated. However, it is difficult to envisage circumstances where doses could be higher than 1 mSv y^{-1} from material containing radionuclides at the exempt concentration level.

Thus, the radionuclide-specific levels are such that:

- (i) the maximum effective dose to individuals using radionuclides, or to individuals subsequently exposed as a result of, or as a consequence of, disposal following use, will be $10 \mu\text{Sv y}^{-1}$ or less under plausible normal circumstances;

- (ii) effective doses from accidents, misuse, or unexpected situations should not be higher than the dose limit for members of the public, and
- (iii) skin doses should not exceed 50 mSv y⁻¹.

Nevertheless, the International Basic Safety Standards do note that exemption of bulk amounts of materials with activity concentrations lower than the exemption levels may require further consideration by the appropriate authority.

References

International Atomic Energy Agency, 1996. *International Basic Safety Standards for Protection against Ionizing radiation and for the Safety of Radiation Sources*, IAEA Safety Series No. 115.

Official Journal of the European Communities, L159, Volume 39, 29 June 1996, Council Directive 96/29/EURATOM of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation.

Harvey MP, Mobbs SF, Cooper J, Chapius AM, Sugier A, Schneider T, Lochard J, Janssens A., *Principles and Methods for Establishing Concentration and Quantities (Exemption values) below which reporting is not Required in the European Directive*, Commission of the European Communities 1993. Radiological Protection No 65, EC Doc XI-028/93, Luxembourg.

International Commission on Radiation Protection 1991, 1990 Recommendations of the International Commission on Radiological Protection, ICRP Publication 60, Annals of the ICRP, **21**: 1-3.

Recommendations for Limiting Exposure to Ionizing Radiation (1995) and *National Standard for Limiting Occupational Exposure to Ionizing Radiation* (1995), NOHSC/ARPANSA, republished in March 2002 as Radiation Protection Series (RPS) 1.

International Commission on Radiological Protection 1994, *Dose Coefficients for Intakes of Radionuclides by Workers*: Replacement of ICRP Publication 61, ICRP Publication 68, Annals of the ICRP, **24**; **4**:

TABLE I: LIST OF EXPOSURE SCENARIOS AND PATHWAYS CONSIDERED IN CALCULATIONS OF DOSES FOR EXEMPTION IN THE BASIC SAFETY STANDARDS.

A	ACTIVITY CONCENTRATION
A1	<p>Normal use (workplace) scenario</p> <ul style="list-style-type: none"> External exposure from a 1 m³ source External exposure from a gas bottle External exposure from handling a source Ingestion from contaminated hands Inhalation of Dusts
A2	<p>Accidental (workplace) scenario:</p> <ul style="list-style-type: none"> This is covered by Normal use (workplace) scenario
A3	<p>Disposal (public) scenario</p> <ul style="list-style-type: none"> External exposure from a landfill site Inhalation of dust from a landfill site Ingestion of object from a landfill site
B	ACTIVITIES/QUANTITIES
B1	<p>Normal use (workplace) scenario:</p> <ul style="list-style-type: none"> External exposure from a point source External exposure from handling a source
B2	<p>Accidental (workplace) scenario:</p> <ul style="list-style-type: none"> Spillage: External exposure from contaminated surface Spillage: External exposure from contaminated hands Spillage: External exposure from contaminated face Spillage: Ingestion from hands Spillage: Inhalation of resuspended activity Spillage: External dose from aerosol or dust cloud Fire: Contamination of skin Fire: External from combustion products Fire: Inhalation of dust or volatiles
B3	<p>Disposal (public) scenario</p> <ul style="list-style-type: none"> External exposure from a landfill site Inhalation from a landfill site External exposure to skin from handling an object from a landfill site Ingestion of an object from a landfill site

ANNEX 2 – DERIVATION OF EXEMPTION LEVELS FOR REGULATORY PURPOSES

Figure 1: Block diagram illustrating method for calculating exempt activities and activity concentrations

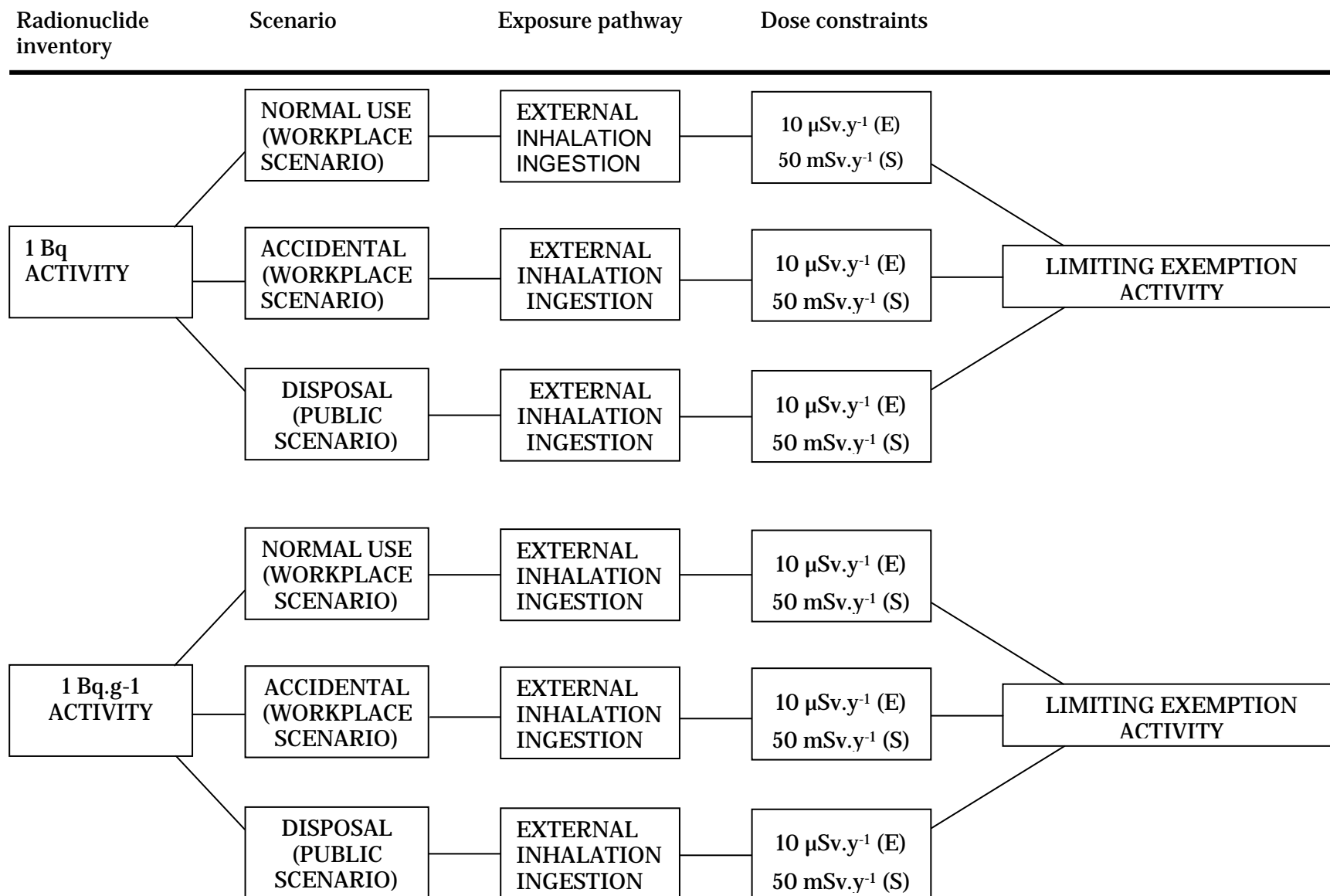
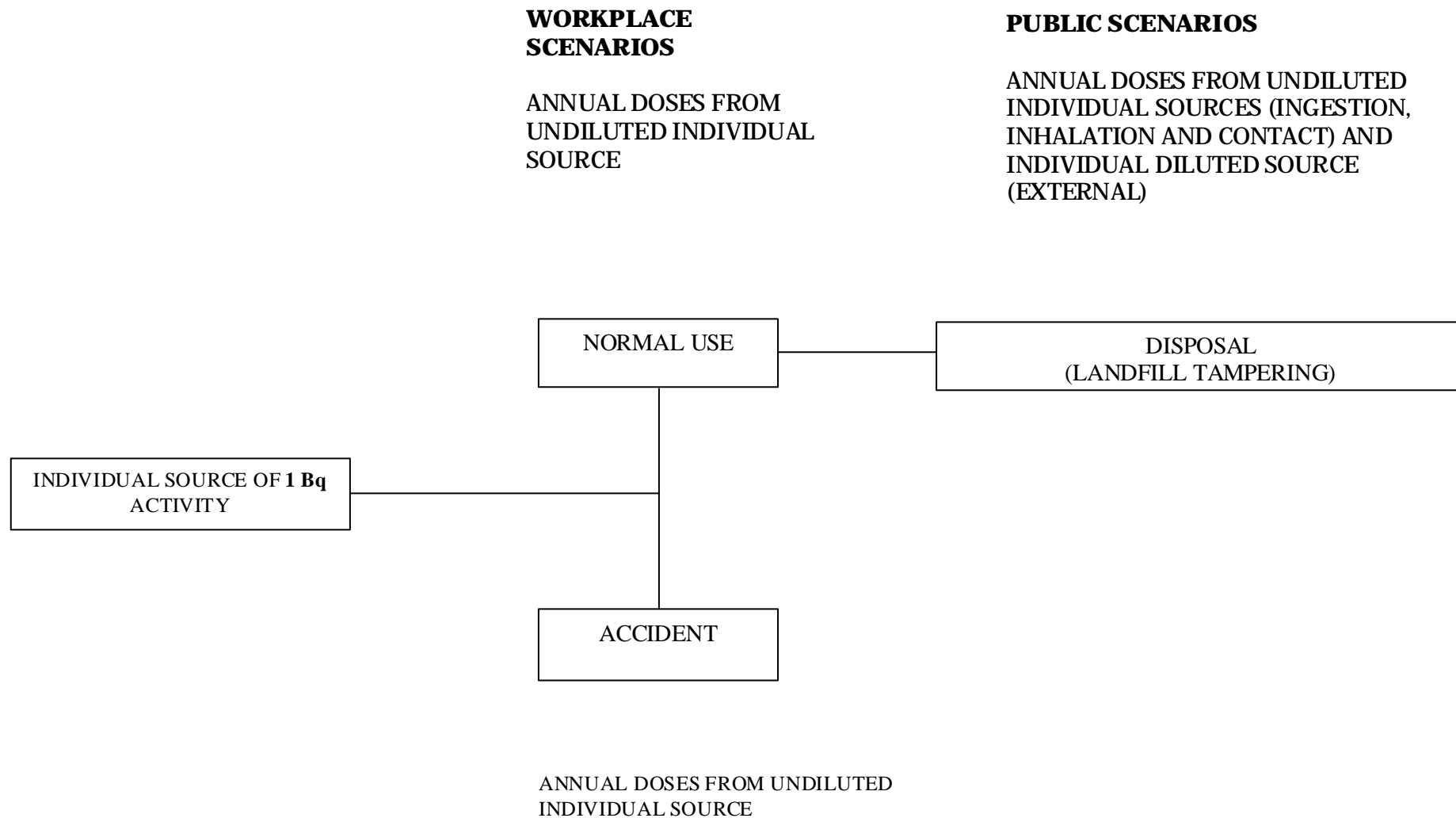
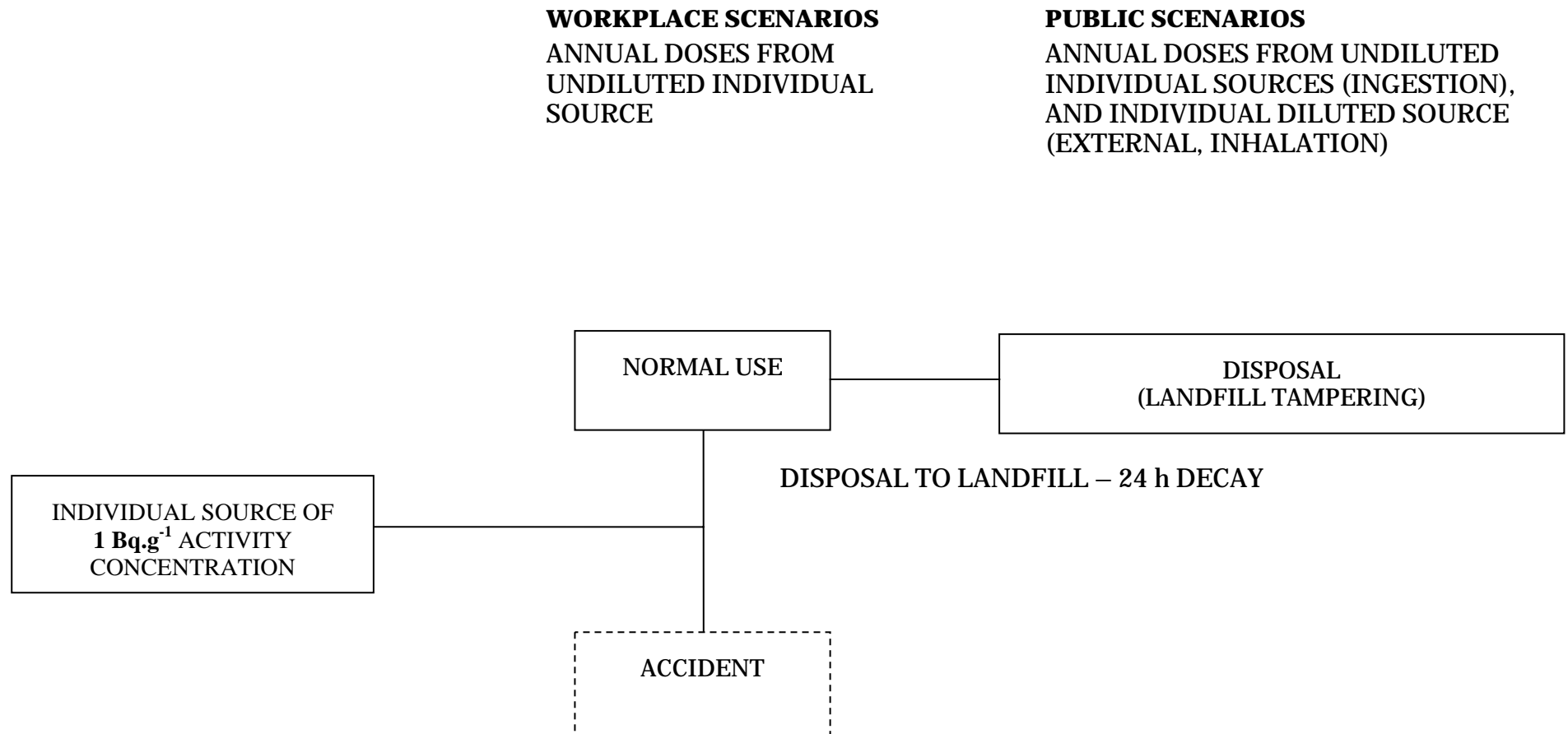


Figure 2: Block diagram showing workplace and public scenarios used to calculate doses for unit activity of 1 Bq



ANNEX 2 – DERIVATION OF EXEMPTION LEVELS FOR REGULATORY PURPOSES

Figure 3. Block diagram showing workplace and public scenarios used to calculate doses for unit activity concentration of 1 Bq.g⁻¹.



Annex 3 - Current status of Radiation Health Series documents and other standards in jurisdictions

	Adopted in regulations	Adopted as requirements, licence or registration conditions
RHS 2 - Code of Practice for the Design of Laboratories using Radioactive Substances for Medical Purposes (1980)		Vic
RHS 3 Code of Practice for the Safe Use of Ionizing Radiation in Veterinary Radiology		NSW, Vic, Tas, NT, SA, Qld, WA, ARPANSA
RHS 4 - Code of Practice for the Safe Use of Radiation Gauges (1982)	SA, WA	NSW, Vic, Tas, Qld NT, ARPANSA
RHS 5 - Recommendations Relating to the Discharge of Patients Undergoing Treatment with Radioactive Substances		Vic, Tas, NT
RHS 8 Code of Nursing Practice for Staff Exposed to Ionizing Radiation (1984)		Tas, NT
RHS 9 - Code of Practice for Protection Against Ionizing Radiation Emitted from X-ray Analysis Equipment (1984)	WA	NSW, Vic, Tas, Qld, NT, ARPANSA
RHS 10 - Code of Practice for Safe Use of Ionizing Radiation in Veterinary Radiology: part 3 - Radiotherapy		NSW, Vic, ARPANSA
RHS 11 Code of Practice for the Safe Use of Soil Density and Moisture Gauges Containing Radioactive Sources (1984)		NSW, Vic, Tas, NT, Qld, WA, ARPANSA
RHS 12 - Administration of Ionizing Radiation to Human Subjects in Medical Research (1984)	NSW	Vic, Tas, NT, Qld, SA(exemptions adopted through Govt. Gazette)
RHS 13 - Code of Practice for the Disposal of Radioactive Wastes by the User (1985)	Tas, ARPANSA	Vic, NT, SA
RHS 14 - Recommendations for Minimising Radiological Hazards to Patients (1985)		Tas, Qld
RHS 15 Code of Practice for the Safe Use of Microwave Diathermy Units (1985)		ARPANSA
RHS 16 Code of Practice for the Safe Use of Shortwave (Radiofrequency) Diathermy Units (1985)		ARPANSA

	Adopted in regulations	Adopted as requirements, Licence or registration conditions
RHS 18 - Code of Practice for the Safe Handling of Corpses Containing Radioactive Materials (1986)		Tas
RHS 19 - Code of Practice for the Safe Use of Ionizing Radiation in Secondary Schools (1986)	SA, Tas	NSW, NT, WA
RHS 20 Code of Practice for Radiation Protection in Dentistry (1987)		NSW, Vic, SA, Qld, Tas, ARPANSA
RHS 21 - Revised Statement on Cabinet X-ray Equipment for Examination of Letters, Packages, Baggage, Freight and Other Articles for Security, Quality Control and Other Purposes (1987)	SA, WA	Vic, NT, Qld, Tas, ARPANSA
RHS 22 - Statement on Enclosed X-ray Equipment for Special Applications (1987)	WA	Vic, NT, Qld, ARPANSA
RHS 23 Code of Practice for the Control and Safe Handling of Radioactive Sources Used for Therapeutic Purposes (1988)		Vic, NT, Tas
RHS 24 Code of Practice for the Design of and Safe Operation of Non-medical Irradiation Facilities (1988)		Vic, Qld, ARPANSA
RHS 25 Recommendations for Ionization Chamber Smoke Detectors for Commercial and Industrial Fire Protection Systems (1988)		Vic
RHS 28 - Code of Practice for the Safe Use of Sealed Radioactive Sources in Borehole Logging		NSW, Vic, NT, WA, Tas, Qld ARPANSA
RHS 29 - Occupational Standard for Exposure to Ultraviolet Radiation (1989)	WA, ARPANSA	
RHS 30 - Interim Guidelines on Limits of Exposure to 50/60 Hz Electric and Magnetic Fields (1989)	WA, ARPANSA	
RHS 31 - Code of Practice for the Safe Use of Industrial Radiography Equipment (1989)	WA, SA	NSW, Vic, NT, Qld Tas, ARPANSA
RHS 34 – Safety guidelines for magnetic resonance diagnostic facilities (1991)		Tas
RHS 35 - Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia (1992)	WA, ARPANSA	
RHS 37 – Code of Practice for the Safe Use of Lasers in the Entertainment Industry (1995)		Tas, WA
RHS 39 - Recommendations for Limiting Exposure to Ionizing Radiation (1995) and National Standard for Limiting Occupational Exposure to Ionizing Radiation (1995) (see Note 2 below)	ARPANSA, Comcare, Qld (Act is based on RHS 39), SA (defns refer to RHS 39 defns)	Tas, SA (in Mining licences)

	Adopted in regulations	Adopted as requirements, Licence or registration conditions
Code of Practice on Radiation Protection in the Mining and Milling of Radioactive Ores (1987)	WA	Vic, NT, SA
Code of Practice on the Management of Radioactive Wastes from the Mining and Milling of Radioactive Ores (1982)		Vic, NT, SA
AS 2772.1 (1990) Radiofrequency Maximum Exposure Levels - 100kHz to 300 GHz	Comcare, WA	
AS 2772.2 Radiofrequency Radiation Principles and methods of measurement - 100kHz to 300 GHz		Comcare
RPS 3 - Radiation protection Standard for Maximum Exposure Levels to Radiofrequency Fields 3 kHz – 300 GHz (2002)	ARPANSA	
AS 2211 (1991) Laser Safety	Comcare, WA	Tas
AS/NZS 2211 Pts 1-2 (1997) Code of Practice for Laser Safety	Qld (use classification system for regulating Class 4 medical lasers), ARPANSA	Comcare
AS/NZS 2243 Pts 1-10 Safety in Laboratories		Comcare
AS 1188 (1990) Radio Transmitters and Similar Equipment - Safe Practices	Comcare	
AS 2397 Guide to the Safe Use of Lasers in the Construction industry	Comcare	
Guidance Note for the Protection of Workers from the Ultraviolet Radiation in Sunlight [NOHSC:3012(1991)]		Comcare

NOTE 1 - All RHS documents will be reviewed and progressively re-published under ARPANSA's Radiation Protection Series but not all of them will be re-published as Codes of Practice or Standards, with some of them being re-written as guidance notes in this Directory.

NOTE 2 - This has been re-published as RPS 1 and has been adopted in Schedule 9 of this Directory.

References

ARPANSA 2001, National Competition Policy Review of Radiation Protection Legislation, Final Report, May 2001

ARPANSA 2002, National Competition Policy Review of Radiation Protection Legislation, Implementation Plan, June 2002

ARPANSA 2002, Recommendations for limiting exposure to ionizing radiation (1995) (Republished 2002), and National Occupational Health and Safety Commission 2002, National standard for limiting occupational exposure to ionizing radiation (1995), (Republished 2002), Radiation Protection Series No. 1, ARPANSA, Yallambie.

ARPANSA 2002, Recommendations for the Discharge of Patients Undergoing Treatment with Radioactive Substances Radiation Protection Series No. 4, September 2002, ARPANSA, Yallambie.

Council Of Australian Governments (COAG), Nov 1997, *Principles and Guidelines for National Standard setting and Regulatory Action by Ministerial Councils and Standard Setting Bodies*

International Atomic Energy Agency 1996, International Basic Safety Standards for protection against ionizing radiation and for the safety of radiation sources, Safety Series No. 115, IAEA, Vienna.

International Atomic Energy Agency 2002, Preparedness and Response for a Nuclear or Radiological Emergency, Safety Standards Series No. GS-R-2, IAEA, Vienna.

National Radiological Protection Board 1999, Mobbs SF & Harvey MP, Exempt Concentrations and Quantities for Radionuclides not included in the European Basic Safety Standards Directive, NRPB-R306, Chilton, UK.

Glossary

Accreditation means an authorisation by the Authority for a person to provide any of the specified radiation protection services identified in this Directory.

Accessible surface means that surface of the apparatus to which human access is possible without the use of tools or without penetration of any radiation shield.

Authorisation means a written permission granted by the Authority for an operating organisation to perform specified practices. The form of an authorisation can include a licence, registration, or accreditation.

Dealing includes to use, manufacture, store, transport, sell, possess, install, operate, maintain, repair, or dispose of, a radiation source.

Defence-in-Depth means the application of more than a single protective measure for a given safety objective such that the objective is achieved even if one or more of the protective measures fails.

Intervention means an action intended to reduce or avert exposure or the likelihood of exposure to sources which are not part of a controlled practice or which are out of control as a consequence of an accident or other event.

Ionizing radiation is defined as meaning electromagnetic or particulate radiation capable of producing ions directly or indirectly, but does not include electromagnetic radiation of a wavelength greater than 100 nanometres.

Ionizing radiation apparatus is defined as an apparatus that produces ionizing radiation when energised, or when assembled or repaired is capable of doing so when energised (e.g. a diagnostic x-ray machine or an industrial radiography x-ray machine).

Legislation refers to Acts and Regulations covering radiation protection, which are in place in Australian jurisdictions.

Licence means an authorisation granted by the Authority to a legal person allowing that person to carry out a practice involving radiation.

Non-ionizing radiation is defined as meaning electromagnetic radiation of a wavelength greater than 100 nanometres.

Non-ionizing radiation apparatus is defined as an apparatus of a prescribed type that when energised produces non-ionizing radiation, or when assembled or repaired is capable of doing so (e.g. laser surgery equipment).

Notification means a document submitted to the Authority by a legal person to notify an intention to carry out a practice or any other dealing described in this Directory.

Nuclear Installation¹⁶ means a nuclear fuel fabrication plant, nuclear reactor (including critical and sub-critical assemblies), research reactor, nuclear

¹⁶ Certain types of nuclear installation may be prohibited in Australian jurisdictions by government policy or other legislation.

power plant, spent fuel storage facility, enrichment plant or reprocessing facility.

Person in this Directory includes a natural person and corporation.

Practice means any human activity that introduces additional sources or exposure pathways or extends exposure to additional people or modifies the network of exposure pathways from existing sources, so as to increase the exposure or the likelihood of exposure of people or the number of people exposed to radiation.

Radiation is defined as meaning electromagnetic waves or quanta and/or sub-atomic particles, propagated through space or through a material medium.

Radiation apparatus means an ionizing radiation apparatus or a non-ionizing radiation apparatus.

Radiation source¹⁷ is defined as anything that may emit ionizing radiation or non-ionizing radiation.

Radioactive material¹⁸ means any material that emits ionizing radiation spontaneously.

Registration means an authorisation by the Authority for a radiation apparatus or sealed source apparatus, or for a premises in which radiation sources are used.

Responsible person in relation to any radioactive source, ionizing or non-ionizing radiation apparatus, nuclear installation, prescribed radiation facility or premises on which unsealed radioactive sources are stored or used means the person:

- (a) having overall management responsibility including responsibility for the security and maintenance of the source, apparatus, installation or facility;
- (b) having overall control over who may use the source or apparatus, installation or facility; and
- (c) in whose name the source, apparatus, installation or facility, would be registered if this is required.

Sealed source is defined as radioactive material that is permanently sealed in a capsule or closely bound and in solid form.

Sealed source apparatus is defined as an apparatus that produces ionizing radiation by virtue of the fact that it contains radioactive material in the form of a sealed source.

[NOTE: Many additional terms require definition and a more detailed glossary will be published in a later version of the Directory.]

¹⁷ For regulatory purposes, subject to the exemption and exclusion provisions of this Directory

¹⁸ For regulatory purposes, subject to the exemption and exclusion provisions of this Directory

Contributors to Drafting and Review

The principal group that developed this National Directory for Radiation Protection on behalf of the Radiation Health Committee was the National Uniformity Implementation Panel (Radiation Control), which has the following membership:

Dr John Loy, (NSW),	CEO of ARPANSA (Chair)
Dr Brad Cassels, (Vic),	Manager, Radiation Safety Unit, Department of Human Services
Ms Hazel Upton, (WA),	Secretary, Radiological Council
Mr Simon Critchley, (Qld), Health	Director, Radiation Health, Department of Health
[to be appointed] (NT),	Manager, Radiation Health Section, Department of Health and Community Services
Mr Graeme Palmer, (SA),	Senior Scientist, Radiation Protection Division, Environment Protection Authority
Mr Len Potapof, (NSW),	Manager, Radiation Policy Unit, Environment Protection Authority
Dr Barbara Shields, (Tas),	Senior Health Physicist, Health Physics Branch, Dept of Health & Human Services
Dr George Koperski, (ACT),	Director, Radiation Safety Section, ACT Department of Health and Community Care
Mr Jim Turnbull, (NZ),	Chief Executive Officer, National Radiation Laboratory, New Zealand

The contributions of NUIP(RC) Working Group members and contractors are also gratefully acknowledged. These include:

Dr Keith Lokan,	contractor
Mr Mark Pegg,	contractor
Mrs Jill Fitch,	Acting Director, Radiation Protection Division, Environment Protection Authority, SA
Mr David Smoker, (ACT),	former Director, Radiation Safety Section, ACT Department of Health and Community Care

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