Curtin University

Radiation Safety Manual

Health and Safety

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1 INTRODUCTION

1.1 Purpose

The purpose of this document is to outline aspects associated with the management of radiation materials and equipment at all Curtin University sites, including purchasing, safe use, storage, management, transportation and disposal. There may be other standards and legislation in addition to those outlined in this document that may need to be considered as applicable.

1.2 Scope

This manual covers the policies and procedures for radiation safety at Curtin University. It is not an educational course or a set of guidelines in radiation safety, although it does contain some overlap where procedures are affected. To maintain brevity in this manual, links to other radiation safety educational material are provided where relevant.

This document applies to all Curtin University staff, students and contractors who are required to use, or access areas containing, radiation materials or equipment within the scope of their duties at Curtin University.

This document should be used in conjunction with other Curtin documentation and procedures surrounding the management of hazardous materials (including specific area safety management plans, area and task specific risk assessments and standard operating procedures). This document has been developed in line with legislation and guidance that were current at the time of writing. New legislation and guidelines developed since the authoring of this document must be considered.

2 RESPONSIBILITIES & CONTACTS

The Radiation Safety Act 1975 and associated regulations impose a number of restrictions for the use of radioactive substances, high powered lasers, x-ray or neutron emitting apparatus and UV transilluminators. All such substances and instruments must be registered and most can only be used under the supervision of a suitably qualified individual with an appropriate WA government issued licence. All projects at Curtin University using such materials and instruments must be approved by the University Radiation Safety Committee before work commences.

2.1 University Radiation Safety Officer

The Radiation Safety Officer (RSO) is a legislated role that coordinates radiation activities at Curtin University to ensure compliance with the Radiation Safety Act 1975 and other regulations. The RSO is responsible for instituting and maintaining a system of radiation safety at Curtin University and is monitored by the University Radiation Safety Committee, comprising members from across the University. The University RSO can offer assistance and advice on all matters related to radiation safety including registration and licensing requirements.

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2.2 Radiation Safety Supervisors

The responsibility for the implementation of the system at a local level rests with the Heads of Schools or Area Managers. Each workplace is responsible for enforcing the procedures and for ensuring that staff and students have the necessary information, instruction, training and supervision before commencing radiation work.

Heads of Schools or Area Managers may nominate a Radiation Safety Supervisor (RSS) to act on their behalf in matters related to radiation safety in their area. Whilst the University Radiation Safety Officer (RSO) carries out the majority of the work related to radiation safety at the University, the RSS forms an integral component of the radiation safety system by overseeing all radiation work in their area. Specifically the RSS will:

1. liaise with the University RSO regarding changes or issues related to radiation safety within their area.
2. advise local staff on the University requirements and processes related to radiation safety.
3. maintain local radiation related documentation.

Staff and students who are planning to conduct radiation related work, or have questions about radiation safety, should in the first instance contact their local RSS.

Table 1. Curtin Radiation Safety Supervisors

Faculty / Location	Work Area	Name	Contact Details
Science and Engineering	Discipline of Applied Geology	A/Prof Fred Jourdan	Phone: +61 8 9266 2412 Email: F.Jourdan@curtin.edu.au
	Discipline of Applied Physics and John de Laeter	Miss Ketesse Hansen	Phone: +61 8 9266 2643 Email: Ketesse.Hansen@curtin.edu.au
	Discipline of Chemical Engineering	Mr Xiao Hua (Jimmy)	Phone: +61 8 9266 9242 Email: Xiao.Hua@curtin.edu.au
	Discipline of Chemistry	Mr Peter Chapman	Phone: +61 8 9266 3425 Email: P.Chapman@curtin.edu.au
	Discipline of Civil and Mechanical Engineering	Vacant	
	Discipline of Exploration Geophysics	Dr Michael Carson	Phone: +61 8 9266 4973 Email: Michael.Carson@curtin.edu.au
	Fuels and Energy Technology Institute	Dr Li Dong	Phone: +61 8 9266 9579 Email: Li.Dong@curtin.edu.au
	Discipline of Medical Imaging Science	Dr Curtise Ng	Phone: +61 8 9266 7314 Email: Curtise.Ng@curtin.edu.au
Health Sciences	CHIRI Biosciences Research Precinct (Building 305)	Dr Rob Steuart	Phone: +61 8 9266 7362 Email: R.Steuart@curtin.edu.au
	School of Pharmacy and Biomedical Sciences	Mr Adrian Paxman	Phone: +61 8 9266 3402 Email: A.Paxman@curtin.edu.au
	School of Physiotherapy and Exercise Science	A/Prof Kathy Briffa	Phone: +61 8 9266 3666 Email: Kathy.Briffa@curtin.edu.au
	School of Public Health	Dr Mala Senaratna	Phone: +61 8 9266 7334 Email: m.senaratna@exchange.curtin.edu.au
Research Office at Curtin (ROC)	Life Sciences Research Facility	Dr Beng Chua	Phone: +61 8 9266 1827 Email: B.Chua@curtin.edu.au
Kalgoorlie Campus		Dr Bogale Tadesse	Phone: +61 8 9088 6636 Email: Bogale.Tadesse@curtin.edu.au

Faculty / Location	Work Area	Name	Contact Details
Sarawak Campus Miri		Mr Kelvin Wong Kin Yin	Phone: +60 85-443939 Email: wongkinyin@curtin.edu.my

2.3 Licence holder

All projects involving radioactive substances, class 3B or 4 lasers, x-ray or neutron apparatus or UV transilluminators must be conducted under the supervision of a suitably qualified person with an appropriate WA Government issued licence.

The licensee must ensure that all radiation users have an adequate level of information, instruction, training and supervision to carry out their duties in a safe manner on a day-to-day basis and that the radiation work is conducted in accordance with their licence conditions and local radiation safe working rules.

2.4 RSS or licensee

The following states the difference between a RSS and a radiation licensee:

- RSS – The RSS is an administrative role appointed by the Head of School to act on their behalf to ensure radiation projects within the area follow University requirements and processes.
- Licensee – the radiation licence holder has a licence granted by the Government to work and supervise others on projects involving radiation. The Licensee has legal responsibilities for the day-to-day radiation safety aspects of the work carried out under their licence.

The roles of RSS and licence holder can be occupied by the same person or by different persons depending on the needs of the area.

2.5 Staff and students

Staff and students who are planning radiation related work, or have questions about radiation safety should in the first instance contact their local RSS. Staff and students are required to comply with the workplace procedures, to report any accidents or incidents and raise any safety, health or security concerns with the RSS. Each individual is responsible for taking reasonably practicable steps to ensure their own safety when working with radiation.

Table 2: Summary of main roles, responsibilities and authorities related to radiation management.

Role	Responsibility under Occupational Health and Safety Legislation	Responsibility under Radiation Safety Legislation	Authority
University Radiation Safety Officer		To institute and maintain a system of radiation safety at the University consistent with the requirements under the Radiation Safety Act 1975 and other associated legislative requirements	Approves and authorises use of radioactive materials, radiation equipment and electronic products (as defined by the Act) at the University.
University Radiation Safety Committee		To provide advice to the University regarding radiation safety and to inform, guide and monitor the University Radiation Safety Officer	Advisory
Heads of Schools/Area Managers	To implement and maintain an effective health and safety system within the School or Area that is consistent with the Occupational Safety & Health Act 1984 and other legislative requirements.		Allocate responsibility for health & safety management and delegation of authority to Radiation Safety Supervisor for aspects related to radiation.
Radiation Safety Supervisors	Delegation from Head of School or Area to ensure staff and students within the School or Area are familiar with University policies and procedures necessary to undertake work specifically related to radiation.		Advisory
Radiation Licence Holders		Ensure all users working under their licence have sufficient information, instruction, training and supervision to carry out their duties in a safe manner on a day-to-day basis and that the radiation work is conducted in accordance with their licence conditions and local radiation safe working rules	Authorises individuals to use specific radiation materials or equipment associated with their licence.
Project Chief Investigators	To undertake effective health and safety measures to ensure compliance with the requirements set out by the Head of School/Area or the Radiation Safety Supervisor.	To undertake effective management measures to ensure compliance with the requirements of the University Radiation Safety Officer/Committee and the Radiation licence holder.	

Individual Workers/Students	To comply with all procedures and report any accidents or incidents and raise any safety, health or security concerns. Take reasonably practicable steps to ensure their own safety	To comply with the conditions of the radiation licence under which they are working and the relevant safe working rules.

3 RADIATION PROJECTS

3.1 Project approval

Before starting any work involving radioactive substances, high powered lasers (class 3B or 4), x-ray or neutron emitting apparatus or UV transilluminators, you must have approval from the University Radiation Safety Officer or Committee. If your Supervisor already has approval to cover your work, they can apply for an amendment to add your name to their project. If not, you must start a new application.

To apply, log into InfoEd using your Curtin credentials and create a new record. User guides are available to assist staff at in the research training page of the staff portal. Students can access the user guides via the student website. Projects that meet all the necessary requirements will be given approval for 1 year, but may be extended indefinitely subject to annual reporting and submission of amendment requests when details of the project change.

Note for students: In the Chief Investigator screen you must delete your name and add your supervisor's name. Add yourself as co-investigator and click save to be able to go back into the system and see the form. If you are a staff member but submitting as a student make sure you use your student credentials.

The application will be reviewed by the:

1. Chief investigator for the project
2. Radiation licence holder(s) for the substances or equipment
3. Local RSS (or, if this role is vacant, the Head of School)

After review, the University Radiation Safety Officer (RSO) will triage your application as either Low-Risk or High-Risk. Low-Risk applications will be processed by the University RSO, whereas High-Risk applications will be assessed by the Radiation Safety Committee.

3.2 Obtaining a licence

All radiation substances and equipment must be used under the supervision of a radiation licence holder. To obtain a licence it is necessary to:

1. Pass an appropriate course accredited by the WA Regulatory body, the Radiological Council. (The latest list of courses can be obtained from the Radiological Council courses webpage).
2. Fill in the appropriate licence application form. (Download from the Radiological Council licence webpage).
3. Contact the University RSO to request a letter of support for your application (necessary for first time applicants only).
4. Send the application to the Radiological Council together with payment.

The licences can be obtained for 1 or 3 years and the Radiological Council will send out a renewal notice directly to the licence holder just before their licence expires. If work is to continue the licence holder must renew their licence and submit a copy of their new licence to on InfoEd. Contact the University RSO for assistance or further advice.

3.3 Quantities requiring a licence

Quantities or radioactive materials below the limits in the following table do not require a radioactive substances licence. However, the University is still required to register the substances, so a project application as described above will be required.

Table 3. Radionuclides requiring a licence

Radionuclide	Quantity (MBq)
^{3}H, ^{51}Cr	40
^{14}C, ^{35}S, ^{55}Fe, ^{99m}Tc, ^{201}Tl	4
^{22}Na, ^{32}P, ^{36}Cl, ^{45}Ca, ^{54}Mn, ^{59}Fe, ^{63}Ni, ^{65}Zn, ^{90}Y, ^{103}Ru, ^{137}Cs	0.4
^{60}Co, ^{125}I, ^{131}I	0.04
^{90}Sr	0.004
^{226}Ra	0.0004

3.4 Training for unlicensed users

Other persons working under the supervision of a licence holder must have a level of training appropriate to the work they are conducting. This training can be one of the WA Regulator accredited courses or an equivalent level qualification. The licence holder must retain documentary evidence of the training of each user under his/her supervision.

For projects involving quantities of radioactive substances below an exempt limit, lasers with power below class 3B, other sources of UV, infrared, microwaves, radiofrequencies, magnetic fields, infrasound or ultrasound, it is not necessary for anyone to have a licence. If the equipment is used in accordance with the manufacturer's instructions then it is sufficient to ensure users read the safe working procedures and risk assessments for the apparatus and undergo training on its use. The supervisor must retain documentary evidence of the training of each user under his/her supervision.

4 FACILITY REQUIREMENTS

Laboratories containing radioactive materials, x-ray instruments or class 3B or 4 lasers must comply with the legislative requirements for their respective use. The requirements can, in some cases, be quite extensive and may depend upon the work that is to be conducted. As such, advice should be sought from the University RSO prior to the establishment of any new facility. A brief overview of the legal requirements common to many facilities is given below. Note, approvals for each project will continue to be required even when many projects utilise the same facility.

4.1 Requirements for radioisotope facilities

All laboratories using radioactive materials must be approved for use by the WA State Government Regulator prior to any work being conducted. The Regulator will require the RSO to submit architectural, plumbing and ventilation plans for the laboratory so as to make an assessment of the laboratory's suitability for radioactive materials work. Architectural, plumbing or ventilation changes can be time consuming and costly. As such, it would be prudent to make arrangements with the RSO for approval many months in advance of the commencement of work in case the Regulator does not initially provide approval.

If Naturally Occurring Radioactive Materials (NORM) are being used or stored, the NORM Management Guidelines should be followed.

4.2 Requirements for laser facilities

Laser facility requirements are detailed in the Radiation Safety (General) Regulations 1983 and refer to Australian Standard AS/NZS 2211.1:2004 for specific items. As with other radiation laboratories it would be prudent to allow time prior to the commencement of work to ensure these requirements are met. In some cases it may take a few months to arrange for the laboratory to have the appropriate security and safety systems in place. For more information see the Laser Facility Guidelines.

4.3 Requirements for x-ray or neutron generating facilities

Rooms containing irradiating apparatus, whether for analysis or diagnostic purposes, may require walls and windows to have appropriate shielding. The plans for this facility will then need to be sent by the RSO to the WA State Government Regulator for approval prior to the commencement of work. In addition, the room in which the apparatus is located and the surrounding area may be required to undergo a 3 month long radiation survey at commencement of operations, or at any other time as specified by the WA State Government Regulator, to confirm radiation levels are below the legislated limits.

Each room or area containing the apparatus must have a sign at the entrance stating that x-ray or other neutron generating apparatus are in that room or area. If the apparatus is not an enclosed unit the room must have a red illuminated sign at the entrance (orange lights supplied with the unit are also acceptable), which must be activated when the instrument is energised. The light must be a 'fail safe' light that de-energises the instrument if the light fails, or there must be another clear and unambiguous method of determining whether the light has failed.

An enclosed unit is defined as one that is constructed so that the primary beam is completely contained within permanent barriers requiring tools to gain access, or is interlocked so that if a barrier is removed the instrument is de-energised and cannot be operated without replacing all barriers.

Partly enclosed units should still have partial barriers and interlocks to minimise the possibility of inadvertent exposure, and the instrument should be situated such that if the shutter is opened while an entrance to the enclosure is uncovered or barriers incomplete, the resultant primary beam must be directed away from areas that may be occupied. These instruments must also be sited in a separate room or cubicle in which there are no other radiation sources.

5 ACQUISITION & MONITORING

5.1 Ordering & importing

A radiation project application or amendment must be submitted before any new purchase of radioactive material, class 3B or 4 laser, x-ray instrument or transilluminator. Some facilities may require modifications to accommodate certain radionuclide activity levels or types of equipment. For repeat orders of radioactive materials already covered by an existing project it is only necessary to inform the local RSS to ensure activity limits for the location are not exceeded.

If ordering radioactive materials from overseas it is necessary to obtain an import permit from the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). Failure to obtain a permit will result in the shipment being held by Customs. The relevant form should be completed (leaving licencee name and licence number fields blank) and submitted to the RSO. The RSO will provide the University licence details and submit the form to ARPANSA. Payment is to be made by the group/department ordering the radionuclide(s).

5.2 Naturally Occurring Radioactive Materials (NORM)

Occasionally natural materials such as rocks or ores may contain radioactive material. Most of these materials have activity levels below certain thresholds and therefore would not be classified as radioactive. However, some natural materials contain higher concentrations of radioactive material and other controls must be in place when acquiring and storing these materials. For more information see the NORM Management Guidelines.

5.3 Records & labelling

Every radiation laboratory is registered with the State regulatory authority to store or use a maximum activity of radioactive material or make use of a specific laser, x-ray or transilluminator. The RSS will have a copy of the registered limits and equipment. The University Radiation Safety Officer (RSO) and local RSS should be informed immediately if radioisotopes in excess of the registered activity limits or new equipment is to be stored, used or moved to another University area not already approved on an existing project. In such an instance a radiation project application or amendment must be submitted.

Records following the movement of radioactive substances and radiation equipment must be kept and regularly updated. Records must detail the properties of the substances or equipment, supplier, arrival date, use details, disposal method and disposal date. Comments could also be included on the form of packaging and perhaps the quality of the packaging. Signed receipts should be obtained where possible. The container and the storage location should be clearly marked with a radiation trefoil symbol. Decanted radioactive chemicals must be written in English, include the product identifier and the activity.

5.4 Radiation monitoring

The objective of radiation monitoring is to ensure that existing safety procedures are effective at keeping dosage and exposures from scattered or incidental radiation as low as reasonably achievable (ALARA).

5.4.1 Personal radiation monitoring badges

Required for users of radioactive substances and x-ray or neutron equipment.

Staff and students working with ionising radiation will need to apply for a personal radiation monitoring badge. These badges are issued on a monthly or quarterly basis and monitor exposures from incidental and scattered radiation. The badges are not appropriate for low energy beta emitters such as ^{3}H or ^{35}S.

- Wear the badge at chest level or as directed by the dosimeter placement icon on the badge. If a lead apron is used in an x-ray area the badge should be under the apron.
- Wear only the badge assigned to you. Don't share badges.
- Replace the badge with the control monitor at the end of each day - this should be in a low radiation background area.
- Don't deliberately expose the badge to radiation.

In addition, personnel using irradiating apparatus that is not enclosed are required to wear wrist or finger dosimeters when using the equipment.

To obtain a badge contact your local RSS. When the badge arrives you can collect it from your RSS or nominated badge coordinator.

5.4.2 Biological monitoring

Required for users routinely handling equal or greater activities per procedure of the following radionuclides: 120 MBq ^{3}H, 5 MBq ^{14}C, 5 MBq ^{35}S or 0.1 MBq ^{125}I.

Urinalysis is required for users of ^{3}H, ^{14}C or ^{35}S. Thyroid analysis is required for ^{125}I. The frequency of monitoring will be determined by the University Radiation Safety Officer (RSO) for different categories of workers and submitted to the WA Radiological Council for approval.

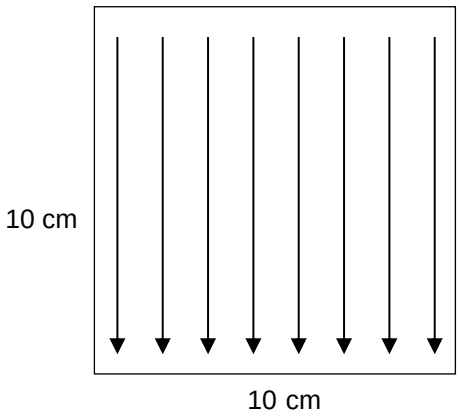
Further information can be obtained from the University RSO.

5.4.3 Wipe testing

Required for users of low energy beta emitting unsealed radioactive substances or contamination testing in radioisotope areas with high level background fields.

Areas using unsealed radioisotopes are required to conduct monthly wipe tests of all radioisotope laboratories. Instructions for wipe testing are as follows:

- Label counting vials with wipe test location (e.g. 1 to 10).
- Wipe tests of bench and sink areas to be over an area of 100 cm^2 (i.e. wipe a square area of bench of sides measuring 10cm x 10cm. It will not be possible to wipe an area of 100cm^2 when wipe testing uneven surfaces such as telephones, centrifuge knobs or heat sealers.
- Use an alcohol swab, moistened glass fibre filter disk or similar material.
- Wiping of bench and sink areas is done as a series of wipes evenly covering the area once. When wiping uneven surfaces, ensure that the surface is wiped once only; that is:



- The wipe can be transferred to the appropriate labelled press-seal bag or counting vial.
- If only beta emitting radioisotopes (e.g. ^{3}H, ^{14}C, ^{35}S, ^{32}P, ^{33}P) are used in the laboratory, then beta counting will be required on a liquid scintillation counter.
- If a combination of beta and gamma emitting radioisotopes are used in the laboratory, then gamma followed by beta counting will be required.
- Transfer wipe into labelled counting tube. For gamma counting close the tube and place in gamma counter ready for counting. For beta counting add liquid scintillant and place in the beta counter for counting. Take care not to place fingers around the side wall of each vial - holding the vial by the rim when adding scintillant, and use a tissue to hold vial when securing the lid. Shake by holding the lid and base of the vial.
- Set the appropriate counting parameter settings for the counter.
- Beta counting can be follow gamma counting for the same wipe test if there is suspected to be a mixture of gamma and beta radioisotopes present.
- Count samples for 5 minutes each and then obtain a printout of results. Transfer results to the "Wipe Test Results" book in the Radiation Manual.
- Rewipe test any areas that have a DPM value in excess of 2 times background, and enter results into the "Wipe Test Results" book.
- Send results to the local RSS and the University RSO.

A template for wipe tests can be downloaded from the Staff Portal.

5.4.4 Radiation surveys

Required for users of radioactive substances and x-ray equipment.

Users of beta and gamma emitting radionuclides should survey their area before and after any procedure involving radionuclides to ensure no contamination is present. A Geiger counter (preferable for betas) or Scintillation monitor (preferable for gammas) are normally used. Any contamination should be cleaned immediately.

Users of partially enclosed x-ray units should perform a radiation survey on a monthly basis to check for radiation leakage from the machine. For totally enclosed x-ray units the radiation survey should occur quarterly. The dose at any accessible point 5 cm from the surface must not exceed 25 µGy per hour whilst the instrument is operating at maximum power. The University RSO must be notified immediately if the leakage dose exceeds the threshold. The survey report must be submitted in InfoEd at the time of the annual review of the radiation project.

Users of open medical x-ray equipment should conduct radiation surveys in accordance with the requirements from the Radiological Council and Manufacturers of the instruments. While these requirements may vary, in-house leakage tests should be conducted at least annually. If leakage tests for these instruments prove impracticable, advice should be sought from the University RSO regarding alternative arrangements.

6 DISPOSAL & DECONTAMINATION

If any radioactive material, class 3B or 4 laser, x-ray instrument or transilluminator is to be disposed of or moved to another organisation the RSO and local RSS must be informed so that the registration details can be updated. The method of disposal is dependent on the type of material or equipment. For disposal of radioactive materials it may be necessary to store them to allow for radioactive decay. If so, a Radiation Waste Storage facility is available at the University for this purpose and can be accessed by contacting the RSO. The group/department disposing of the radioactive materials or radiation equipment is responsible for the costs of disposal.

6.1 Disposal of radiation equipment

Final disposal of any irradiating apparatus or electronic product must be carried out by a licensed service person in accordance with the methods below:

- X-ray equipment – at minimum the x-ray tube must be disabled, by eliminating the vacuum inside the x-ray tube by physically breaking the glass envelope, and the high-tension cables must be severed, to render the equipment inoperable. It would also be preferable to remove the circuit board controlling the high voltage generator where possible.
- Lasers – removing the power supply (by severing the cord) and removing the critical optical components and the amplifying medium to render the equipment inoperable.
- Transilluminators – removing the power supply (by severing the cord) and removing the UV lights from the unit and destroying them will render the equipment inoperable.

6.2 Disposal of liquid radioactive waste (water soluble)

Liquid radioactive waste is best disposed of via the sewer system. Such waste must only be disposed of via flushing sinks connected to approved radioactive drains provided for this purpose.

Ensure that the activity per flush is below the legal dilution concentration limit for each radionuclide and that the waste complies with the Water Corporation's 'Acceptance criteria for trade waste'.

6.3 Disposal of sealed, solid or liquid (non-soluble) radioactive waste

6.3.1 Segregation

Waste must be segregated according to the radionuclide and the type of waste. For example:

- Sealed sources
- Biological material (e.g. food, animal carcasses)
- Sharps (e.g. syringes, broken glass)
- Scintillation cocktail from counting tubes
- General laboratory waste (e.g. gloves, paper towels)

Long-lived radionuclides must not exceed the activity box limits as outlined in the following table.

Table 4. Long-lived radionuclide box limit

Radionuclide	MBq	mCi
^{3}H	48	1300
^{14}C	3.4	92
^{36}Cl	2.2	59

6.3.2 Packaging

Solid waste must be sealed in a red plastic bag. Other liquid waste must be sealed in a screw top bottle or vial before being sealed in a red plastic bag. Any sharps, such as needles or broken glass, must be enclosed in a hard container (metal tin or plastic sharps container).

The red plastic bag or hard container must be placed in a cardboard box or multi-walled paper bag with the words 'Radioactive material' printed clearly on the outside. The box or bag must then be sealed with tape that is suitable for storage (50 mm wide masking tape is commonly used).

6.3.3 Labelling

Label the waste box or bag with the type of waste it contains together with a contact name and location of where the waste comes from. Write the radionuclide and provide an estimate of total activity. Only use units of activity (Bq, Ci and their derivatives). Do not use other units such as counts per second or Bq per mL.

6.3.4 Transportation

Confirm whether the activity of the waste is low enough to be transported as an 'excepted package'. Liaise with the University Radiation Safety Officer to arrange a time for delivery to the University radiation waste store and transport the waste at the designated time. Ensure the waste is handed directly to staff at the store. Do not leave radioactive waste unattended at any time.

6.4 Spills

6.4.1 Emergency procedure

- Verbally warn all other persons in the area and obtain assistance to contain and control the spill.
- Locate the spill kit and evacuate the immediate area around the spill by using absorbent mats and overshoes to create a path away from the spill without spreading contamination.
- Move everyone to a safe area to wait for a decontamination assessment. Mark out and restrict further unnecessary movement into and through the spill area. Don't allow anyone else to leave the safe area until they have been assessed by personnel trained in decontamination.
- Ensure anyone with a serious injury receives proper medical attention. The treatment of serious injury must take precedence over decontamination and containment. Inform medical personnel of the nature of the spill if they need to take away anyone with an injury.

- Call Security on ext 4444 (9266 4444 from a mobile). Security will isolate the affected area and notify the Radiation Safety Officer.
- If you have been trained to do so, commence decontamination of individuals affected by the spill.
- Wait for the arrival of the Radiation Safety Officer for a final decontamination assessment.

6.4.2 Decontamination

- Decontaminate individuals first, followed by the general area, followed by individual items of equipment.
- While attending to contaminated persons ensure protective clothing (lab coats, gloves, overshoes, safety glasses) are worn.
- Soak up any liquid contamination from skin and clothing with dry tissues.
- Make way to wash area, avoiding spreading the contamination further.
- Using a fresh set of gloves, remove any contaminated clothing.
- Decontaminate contaminated skin and/or eyes, by washing only the contaminated area. Do not pour on water or use a safety shower as this can spread the contamination.
- Monitor progress of personal decontamination.

6.4.3 Reportable spill quantities of radioactive materials

Table 5. Quantities of radionuclides spills that must be reported to Radiological Council

Radionuclide	**Quantity (MBq)**
^{3}H, ^{51}Cr	400
^{14}C, ^{35}S, ^{55}Fe, ^{99m}Tc, ^{201}Tl	40
^{22}Na, ^{32}P, ^{36}Cl, ^{45}Ca, ^{54}Mn, ^{59}Fe, ^{63}Ni, ^{65}Zn, ^{90}Y, ^{103}Ru, ^{137}Cs	4
^{60}Co, ^{125}I, ^{131}I	0.4
^{90}Sr	.04
^{226}Ra	.004

7 OTHER RADIATION SAFETY INFORMATION

7.1 Mobile phones

Mobile phones emit radio frequency electromagnetic radiation. At Curtin there are no specific requirements or advice about the use of mobile phones or any potential health effects beyond that already provided by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) on their website. The University follows and monitors this advice and will update staff and students about any changes.

7.2 Laser pointers

Laser pointers, whilst a useful training tool, can present a hazard capable of causing harm to eyes. They have become relatively common and have unfortunately sometimes been misused on humans. More information about laser pointers and lasers in general can be found in the University's Laser Safety Guidelines.

7.3 External radiation safety links

- WA Radiological Council
- Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)
- International Commission on Radiological Protection
- International Commission on Non-Ionizing Radiation Protection
- Australasian Radiation Protection Society
- United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)
- Live chart of nuclides
- Royal Society of Chemistry Periodic Table of the elements
- WISE – Uranium Project
- World Information Service on Energy
- Australian X-ray Analytical Association