

3.1 RESPONSIBILITIES OF CSU STAFF WHO SUPERVISE OTHER STAFF AND STUDENTS

The Environment Protection Authority (EPA) is a statutory body with specific powers under the Environment Protection Legislation. In September 2003, the EPA became part of the Department of Environment and Conservation (DEC).

The Radiation Control Act 1990 (the Act) and Radiation Control Regulation 2003 (the Regulation) impose restrictions on persons using radioactive substances, Ionising radiation apparatus and certain types of non-ionising apparatus.

Copies of the Act, Regulations and Codes of Practice are available from the Radiation Safety Committee (RSC).

The Occupational Health and Safety Act of NSW (2000) and the Radiation Control Act of NSW (1990) established a legally enforceable “duty of care” on **all employers and employees** to maintain a safe working environment. **Employers** must ensure that all employees who use radiation apparatus or radioactive substances hold an appropriate licence and must comply with the conditions of the licence, or have been issued with a Licence Exemption allowing them such use.

A **Supervisor/Manager** can be found guilty under the Act for failing to maintain a safe environment by acts of either commission or omission and be held liable. Similarly, an **employee** can be found guilty of contributing to an unsafe working environment in his/her immediate vicinity again by acts of commission or omission, and held liable. If an employee contravenes any provision of the Act or the Regulation, the employer is also considered to have contravened the same provision.

- (i) The **Deans of Faculty and Centre Directors** have overall responsibility for ensuring the safe use of radioactive material within their areas. Supervisors are required to carry out regular inspections to ensure that rules and regulations are being complied with and have the authority to order that all activities cease until safe working procedures are in place and are being followed.
- (ii) The University requires that the **leader of any research group** or team using radioactive material obtain a licence. This person is responsible for ensuring that the practices listed under (iii), above, are carried out, and that the conditions of the licence are appropriate (e.g. may need to include authority to grant exemptions and/ or the authority to supervise students, see *Radiation Licence Exemptions, Section 3.2.2*).
- (iii) **The user of any radioactive nuclide** must be a person holding a Radioactive Substances Licence. The only exception to this requirement are students who must be supervised by a licence holder, who has the condition of licence to supervise and have been granted an exemption by a licence holder who has the authority to do so endorsed on his/her licence (see (iv) below). Each licence holder has the responsibility for ensuring:
 - all requisitions for the purchase of radioactive material and / or equipment for their use carries their name and licence number on the approved University form and that the material and activity is covered by the licence conditions;

- all students under their supervision are fully trained in the safe storage, use and disposal of radioactive material and in the maintenance of the appropriate records;
 - monitoring equipment as appropriate is available during any procedure involving the use of radionuclides and that all relevant personal monitors are used and stored correctly when not in use; and
 - laboratory protocols are available detailing all procedures using radionuclides, including safety precautions, disposal and monitoring requirements.
- (iv) The Radiation Control Regulation of NSW (2003) stipulates that **the applicant for a radioactive substance licence** is required to undergo an approved radiation safety training program. Training will be arranged at a cost to the applicant by CSU under the auspices of the RSC.
- (v) Each **Licence-holder** shall be responsible for the maintenance of three registers: laboratory use of radionuclides; storage of radionuclides and disposal of radionuclides.
- (vi) It is the responsibility of **all personnel, both supervisors and students**, who are involved in the use of radioactive material to notify the Dean of Faculty, Head of School or Centre Director if they are pregnant, prior to the use of or involvement with the radioactive material.

During pregnancy, the use of radioactive material must be kept to a minimum. Supervisors must ensure all reasonable steps are taken to ensure pregnant personnel's irradiation is minimized. Any steps can only be taken following the notification of the pregnancy as stated above and are to be taken in accordance with the ICRP Publication 60 recommendations of irradiation during pregnancy.

- (vii) **Supervisors** must ensure that all students proposing to undertake research involving the use of radioactive substances and/or irradiating apparatus:
- complete the *Proposal Form to Undertake Research Which Involves the Use of Ionising Radiation (RSC 6)* (available in the Appendix to this Manual) and submit it to the Radiation Safety Committee for an assessment of the radiation safety implications of their proposal (see clause 4.4 of the University's *Code of Conduct for Research*);
 - are issued with, and wear, approved personal monitoring devices for measuring and detecting cumulative exposure to ionising radiation.

3.2 RADIATION LICENCES

3.2.1 Obtaining/Renewing Radiation Licences

The Radiation Control Act (NSW) 1990 requires that all persons using radioactive substances or radiation apparatus, as defined under the Act, must hold a licence suitable for that use, and must comply with the conditions of the licence.

To *obtain a Licence*, the applicant must:

- obtain an EPA application form from the Executive Officer, RSC;
- ensure that they meet the of training/education/experience requirements including undertaking course(s) to meet the requirements;
- complete the EPA application form;
- forward the application form, photocopy of qualifications (degree, diploma, and training certificates) and completed purchase requisition to the Executive Officer of the RSC for approval (Note that personal experience is included on the EPA application form);
- forward the application, photocopies of qualifications and RSC approval to the EPA together with the licence fee via Purchasing; and
- forward a copy of the Licence to the Executive Officer of the RSC.

On *renewal* of the Licence, the Licensee must:

- forward the EPA tax invoice and purchase requisition to the Executive Officer of the RSC for approval;
- forward the RSC approved purchase requisition and EPA tax invoice to Purchasing; and
- forward a copy of the renewed Licence to the Executive Officer of the RSC.

NB – The correct fee payable for either a new licence or renewal, can be found at the following website: <http://www.epa.nsw.gov.au/radiation/fees.htm>

3.2.2 Radiation Licence Exemptions¹

In order to grant approval for an exemption from the requirements under clause 8 of the Radiation Control Regulation 2003, a person must apply to the Environment Protection Authority (EPA) to *have their licence varied*.

To qualify, a person shall provide evidence to the EPA that they are in a supervisory or management position over:

- those persons seeking an exemption from licensing; and
- those licensees who would be supervising the persons granted exemptions.

Persons who may be exempted from licensing requirements

¹ Under clause 8 of the Radiation Control Regulation 2003
Information for employers from EPA Radiation licence exemptions

- A medical registrar at a hospital who is training in nuclear medicine, diagnostic radiology, radiation oncology, ophthalmology, dermatology, rheumatology or in a medical discipline which uses fluoroscopy.
- A student in medical radiation technology who is a trainee technologist in nuclear medicine, diagnostic radiology or radiation oncology.
- An undergraduate student in a university or other educational institution who is undertaking course work or research.
- A postgraduate student in a university or other educational institution who is undertaking research or higher studies.
- A registered nurse at a hospital or a medical officer at a hospital who is required to inject radiopharmaceuticals by that hospital (but only if a person who is the holder of a licence and who is able to inject the radiopharmaceuticals is not readily available at the hospital).
- An assistant to an industrial radiographer.

An exemption does not have effect unless the person is the subject of an approval and complies with the conditions of the approval.

Criteria to be able to grant an approval:

- A person who holds a licence may be eligible to give approvals to exempt certain persons from requiring a radiation licence, but this is only allowed if the condition of their licence allows them to do so.
- The person granting the approval must be in a position to directly supervise the person seeking an exemption from licensing, or ensure that the person is supervised by another licensee. Appropriate levels of supervision are given in section 5.

How to obtain the licence condition to grant approvals:

- Obtain a letter from a person in a management position stating the place of employment and confirming that the nominee(s) satisfy the criteria and send it to the Director, Radiation Control Section, EPA.
- Each nominee to complete an Application to vary licence conditions form (parts 1, 2, 3 and 8) requesting the ability to grant approvals for licence exemptions to a nominated class of persons, as in 3.2.2.1. The nominee(s) signature is required to verify agreement to the variation. The completed application form should be submitted to the Radiation Control Section, EPA.

Exemption Requirements

A supervisor who has an exemption authority as a condition of their licence shall **complete Form RSC 9** (see Appendix), for each student or class of students to be granted an exemption.

The approval must:

- be in writing;
- specify the radioactive substances or radiation apparatus to which it relates;

- set out any additional conditions to which it is subject;
- identify each person, or class of persons, to whom it relates;
- identify the person, or class of persons who are to supervise. For example, radiographers are to supervise student radiographers undertaking clinical experience or use the individuals' names; and
- be given to each person to whom it relates, or
- conspicuously displayed at each place in which the radioactive substances or ionising radiation apparatus to which the approval relates are proposed to be used; and
- a copy lodged in the central records.

Supervision Requirements

The person who grants approval for an exemption must ensure that each person so approved is supervised by a qualified person.

Definitions of supervision:

- a *qualified person* in relation to supervision for a particular radioactive substance or item of radiation apparatus, is the holder of a licence which allows them to provide supervision with respect to that substance or item.
- *general supervision* is supervision by a qualified person who oversees and ensures that the person follows safe radiation work practices in relation to the use of radioactive substances or radiation apparatus.
- *immediate supervision* means supervision by a qualified person who is present at all times during, and is observing and directing, the use by the person being supervised of radioactive substances or radiation apparatus.

Medical radiation technology students who are trainees in nuclear medicine, diagnostic radiology or radiation oncology OR ***general undergraduate students*** who are undertaking coursework or research shall be subject to:

- immediate supervision at all times while the person is using the radioactive substances or radiation apparatus to which the approval relates in clinical situations involving patients;
- immediate supervision² at all times during the first 6 months of the person's training; and
- general supervision³ after that period.

Undergraduate students who are undertaking coursework or research shall be subject to:

- immediate supervision at all times while the person is using the radioactive substances or radiation apparatus to which the approval relates in any clinical situation involving patients; and
- general supervision at all other times.

² Immediate Supervision – supervision by a qualified supervisor who is present at all times and observing and directing the person being supervised.

³ General Supervision – supervision by a qualified supervisor who oversees the person being supervised and ensures that safe radiation work practices are being followed.

Postgraduate students who are undertaking coursework or research shall be subject to:

- general supervision at all times.

3.2.3 Completion of Registers of Licence Holders/Radioactive Substances/Irradiating Apparatus and Personal Dosimetry

The Radiation Safety Committee is responsible for maintaining Registers of all Licence Holders, Radioactive Substances and Irradiating Apparatus used or stored within Charles Sturt University.

The Register will maintain its currency by:

- Distribution of Register of Licence Holders Form **RSC 3** (Appendix 3), Register of Irradiating Apparatus Form **RSC 4** (Appendix 4) and Register of Radioactive Substances Form **RSC 5** (Appendix 5) to all relevant Schools and Centres at Charles Sturt University. This will be done **annually in October**.
- generating reports from the Register for cross reference with the completed Forms.
- generating reports from the Register for expired Licence Holders.
- cross referencing data obtained from RSC staff or an external radiation expert who have conducted site inspections of radioactive substance or irradiating apparatus sites.
- cross referencing of data obtained from Schools / Centres records of their monitoring of staff / students for exposure to ionizing radiation.

3.3 RADIOACTIVE SUBSTANCES

3.3.1 Purchasing/Obtaining Radioactive Substances

Prior to bringing any radioactive substance, as defined in the Radiation Control Act (NSW) 1990, into CSU, approval from the Radiation Safety Committee **must** be obtained. This includes purchases *or any other means of acquiring the radioactive substance* such as through loans or donations from other departments, either within or external to CSU.

To obtain RSC approval for the *Purchase* of a Radioactive Substance, the applicant shall:

- complete the *white-coloured* copy of the “Application to Purchase/Acquire Radioactive Substances and Notice of Disposal” form. This form is located in the quadruplicate book of forms in each radiation facility. Copies of the books can be requested from the Presiding or Executive Officers of the RSC; and
- forward the form to the Presiding/Executive Officer of the Radiation Safety Committee, *together with the Purchase Requisition form*, for approval.

After consideration, the Presiding/Executive Officer will endorse the form and forward it and the purchase requisition directly to purchasing. A copy of the acquisition form will be sent to the applicant with an RSC Approval Number.

Note:

Any shipment of radioactive materials must be delivered to and signed for by the consignee. A note must be included in the body of the purchase requisition, with the following wording: **Purchasing: Please delete current ship to instructions from purchase order and replace with the following noting clearly that** “the shipment must be delivered to and signed for by the consignee”.

3.3.2 Notification of Arrival of Radioactive Substances

In order to keep an accurate record of radioisotopes stored at the University, it is important that the licence-holder advises the Radiation Safety Committee when the substance ordered is actually delivered.

Upon the *Arrival* of a Radioactive Substance, the licence-holder shall:

- complete the *blue-coloured* copy of the “Application to Purchase/Acquire Radioactive Substances and Notice of Disposal” form (located in the quadruplicate book of forms in each radiation facility);
- forward the form to the Presiding or Executive Officer of the Radiation Safety Committee so that the database may be updated; and
- remove a self-adhesive label from the rear of the quadruplicate form book, complete the appropriate details and attach it to the substance’s container prior to use/storage.

3.3.3 Notification of Disposal of Radioactive Substances

Licence-holders, who are responsible for the safe use and storage of a radioactive

substance, are also responsible for the safe **disposal** of that substance. Means of safe disposal of a radioactive substance will vary for individual substances. This information can be obtained from the supplier or from the Waste Minimisation and Management Act Guidelines “Environment Guidelines: Assessment Classification and Management of Liquid and Non-Liquid Wastes”, the EPA or from the Radiation Safety Committee.

Disposal of a radioactive substance *also includes the decay of the substance to below its reportable level or forwarding the substance to another facility within or external to the University.*

On disposal, the licence-holder shall:

- complete the *pink-coloured* copy of the “Application to Purchase/Acquire Radioactive Substances and Notice of Disposal” form (located in the quadruplicate book of forms in each radiation facility);
- forward the form to the Presiding/Executive Officer of the RSC so that the database may be updated.

3.3.4 Laboratory Records

- The *lemon-coloured* copy of the “Application to Purchase/Acquire Radioactive Substances and Notice of Disposal” form (located in the quadruplicate book of forms) shall remain in each book for the radiation facility records.

Register of Laboratory Use of Radionuclides

A file shall be maintained in each laboratory detailing the purchase, use, amount disposed of, and method of disposal of all radioactive material under their control.

Register of Storage of Radionuclides

A register shall be provided to keep track of the nuclides in storage -“All stocks of radionuclides shall be stored in accordance with supplier’s recommendations”, and the storage conditions shall comply with both the legal requirements as defined in the Radiation Control Regulation (2003) and any legal precedents.

The RSC will conduct regular inspections of the storage facility and any solutions not marked with the licensee’s name, description of contents, activity, date of receipt and RSC number corresponding with the register entry will be disposed of

It is understood that the fine details of the management of radionuclide storage will vary from area to area. Ideally there should be a “Radiation Room” where manipulation of high activity stock material is carried out. It is expected that there will be only a minimum number of facilities used for storage of all stock material and the obvious location for this would be in the radiation room. It is understood that this may be impractical given the location of particular laboratories and relationships between laboratories. Nevertheless, it is expected that a record of amount of radioactivity in storage be kept. Where the Radiation Room or work area is only being used by one research group these could form part of the records discussed in the Laboratory Use of Radionuclides of this section.

Register of Disposal of Radionuclides

- All disposal needs to be checked against the Radiation Control Act, Regulations and the Waste Minimization and Management Act Guidelines. Some of the aqueous waste may be disposed of down the sink (see section 4.1.4 (v)) in the Radiation Room either immediately or after being allowed to decay, with the appropriate dilution.
- All disposals must be entered in the Disposal Register maintained in a particular radiation room or work area. (Please check local council regulations and trade waste agreements).
- Details for safe disposal can be obtained from the RSC.

3.3.5 Guidelines for the Storage of Radioactive Materials

All stock solutions of radionuclides must be stored in the designated storage facility within the Radiation room. Any high activity working solutions must also be stored within the facility and;

- all items stored must be marked with the following:
 - (a) department/laboratory;
 - (b) radionuclide(s);
 - (c) activity;
 - (d) description of contents;
 - (e) date;
 - (f) name of user;
 - (g) date of receipt;
 - (h) the RSC number; and
 - (i) all this information is to be entered into the facility register.
- any items not properly stored and marked should be appropriately disposed of.
- any material that has expired, or is no longer in use must be disposed of by the user.
- both the radiation facility and the actual storage sites (for example, refrigerator, cupboard) **MUST** be lockable; the facility must be locked when not in use and the storage site must be kept locked at all times except when accessing materials.

3.3.6 Guidelines for the Safe Use of Radionuclides

All individuals who use radionuclides should be monitored with personal dosimeters designed for this purpose. All radioactive material must be considered potentially highly dangerous, and be handled accordingly. As a minimum, the precautions used in sterile techniques for handling pathogenic material should apply at all times.

PLEASE NOTE: PIPETTING BY MOUTH IS NOT PERMITTED

Any person using radioactive material for the first time must consult their supervisor, and satisfy the following criteria:

- (i) that they are trained in radiation safety and understand the procedures being used;

- (ii) that they understand, and have in place, procedures for monitoring the laboratory and personnel, procedures for separation and disposal of waste, procedures to minimise or contain spills, and in the event of a spill or other emergency, know what steps to take;
- (iii) laboratory coats and the appropriate gloves should always be worn. Eating, drinking or smoking in an area where radioactive material is being used is strictly forbidden. Personal dosimeter must always be worn. Coats should be removed before leaving the Radiation Area and hands washed;
- (iv) care must be taken to avoid cuts or puncture wounds. Cracked or chipped vessels are not to be used. Any small existing wound should be covered with waterproof dressing during procedures using radioactive materials, as well as wearing disposable gloves;
- (v) in the laboratory, especially when working with Beta producing nuclides, eye protection **MUST** be worn at all times. If there is a risk of splashing during an experiment, suitable face and eye protection must be selected. Disposable gloves **MUST** be worn for all procedures involving radioactive concentrations greater than 4kBq/ml, or total activity greater than 0.4MBq. Gloves should be checked with a radiation monitor before disposal;

If they exhibit no detectable contamination, then there is no need to treat the gloves as radioactive waste and they can be placed in the normal laboratory bin. If, however, there is contamination twice background or more, then they must be treated as solid radioactive waste and disposed of as indicated in section 4.8 below.

Please Note: It is important not to handle non-contaminated objects with contaminated gloves, particularly if they are not part of the procedure, ie: door handles, taps, any multiple user item. A radioactive worker must be conscious of this when planning the procedure and if necessary be prepared to use a number of pairs of gloves.

- (vi) hands **MUST** be washed and hands and clothing checked with the radiation monitoring equipment before beginning the task and at the completion of the procedures undertaken;
- (vii) a radiation monitor, with a probe appropriate for optimal detection of the energy or particles being emitted by the nuclide in use, **MUST** be nearby and switched on to “audio” during all manipulations. If there is doubt concerning the appropriate monitor, then consult your supervisor or members of the RSC;
- (viii) all operations or manipulations with the nuclides as delivered **MUST** be carried out in the “Radiation Room” which should be clearly designated with appropriate warning signs. If it is absolutely essential that some procedures are carried out in ordinary laboratories then the activity that will allow this is the activity that is well below the scheduled level (Schedule 1 of the Radiation Control Regulation).

It is the user’s responsibility to ensure that all material is disposed of once it has expired or is no longer required. When working with a particular element or compound, the total toxicity must be taken into account in its use. The total toxicity may be more than is indicated by the radioactive nuclide itself. For example, the compound may be a heavy metal, or carcinogen or a metabolic poison. These features may dictate the specific manner in which a

substance is to be handled, in addition to the normal radiation safety requirements. It is the responsibility of the person working with the materials, as well as the facility manager, to ensure that they are aware of all safety ramifications of the substance(s) being used.

(ix) **Designation of Work Area**

It is essential that any area in a laboratory where work with radionuclides, regardless of whether above or below the scheduled level, is being performed be clearly marked and every precaution taken to contain any accidents or spills. At the very least, this area should be marked with radioactive warning tape and lined with a disposable bench covering such as Bench-Kote. In addition, staff who regularly work with radionuclides should have access to, or have constructed, a plastic or stainless steel tray to place on the bench when working with radionuclides.

The tray should be of size to conveniently contain all required equipment and a "lip" sufficient to prevent the spread of any spill.

(x) **Shielding**

Ideally any work requiring shielding shall be conducted only in the registered DRA. Beta emitters should not be stored behind lead shielding because of the production of bremsstrahlung x-rays. In addition, for work with concentrated solutions and strong gamma emitters, lead sheet shielding or lead brick walls may be necessary to protect the worker from unnecessary exposure. Details of such shielding should be available from members of the Radiation Safety Committee.

(xi) Radioactive iodine and any other volatile or sublimating nuclide or nuclide dissolved in a volatile diluent must be processed in a Fume Hood only in the Radiation Room.

(xii) After completion of any experimental procedure, all waste should be removed as specified below. All contaminated equipment or utensils must be removed, decontaminated or washed and disposed of appropriately.

(xiii) Any washing of contaminated equipment should be performed in the sink in the Radiation Room. If possible the items should be rinsed well under running water and then allowed to soak in the appropriate detergent in carefully marked buckets before scrubbing and rinsing etc. All contamination must be removed before returning items to the laboratory equipment pool.

3.3.7 Guidelines for the Disposal of Radioactive Waste

Storage and waste disposal is the responsibility of the waste generator. It is strongly recommended that Waste Management principles be applied to all work generating radioactive wastes.

Prior to disposing of any radioactive (or decayed radioactive) waste, producers of waste should *also* consider whether the wastes might be hazardous in other ways (e.g. chemical, biological), apart from the radioactivity.

Radioactive waste can be very complex to manage for the generator. Disposal via the sewer system is not a suitable option as there are limitations placed on the contamination of the sewer system by the State and Local authority. The Hospitals and Universities Radiation Safety Officers Group (HURSOG) has an agreement with

Sydney Water (the Main NSW Authority and thus most other NSW Water Authorities) that allows contamination of the sewerage up to 100Bq/g, and this is what all NSW Hospitals and Universities work to as a maximum.

As such the University sets the limit for disposal via the sink/sewerage system as that of the HURSOG Agreement, and that is that no radioactivity greater than 100 Bq/g (or ml) is allowed into the sewerage system. This is only if the nuclide has no chemical or biological characteristics that could effect the environment (e.g., heavy metal, carcinogen, etc.) and thus would place it under control of other legislation such as the *Environmentally Hazardous Chemicals Act 1985*.

Under the Radiation Control Act 1990 and Regulations 1993 (and all subsequent amendments) it is a requirement that the institute has received written authority from the Director-General to dispose of radioactive waste. The D-G has not had any need to this date to give written authority to an institute and as such this is not currently required for compliance.

Also, there are no set limits defined under this legislation, with the only legal requirement being that complete records of disposal are maintained.

For all solid and liquid waste (including radioactive waste), that is being collected and processed by a licensed waste contractor, the document **Environmental Guidelines:**

Assessment, Classification & Management of Liquid & Non-liquid Wastes, must be adopted into the waste procedures. This document is enacted through the *Protection of the Environment Operations Act 1997*.

Under this document, Radioactive Waste is classified as the following:

Hazardous Waste

Liquid or non-liquid waste has a specific activity greater than 100 becquerels per gram and the total activity is more than the prescribed activity of any radioactive element listed in The Prescribed Schedule on the following pages, or Additionally, for liquids the specific activity ratio, or total activity ratio, (see formulae below) is greater than 1.

Industrial Waste

The specific activity ratio, or total activity ratio, (see formulae below) is greater than 1 for non-liquid waste, provided no other chemical or biological characteristic would make it classified as Hazardous.

Non-radioactive

The other characteristics (chemical or biological) of the waste take precedence if the specific activity ratio, or total activity ratio, (see formulae below) is equal to or less than 1.

The formulae for the classification of radioactive waste are:

The **total activity ratio** is calculated using the expression:

$$\text{Total activity ratio} = (A1 \times 10^{-3}) + (A2 \times 10^{-4}) + (A3 \times 10^{-5}) + (A4 \times 10^{-6})$$

where A1 to A4 are the total activity of Group 1 to Group 4 radionuclides, as set out in Column 1 of The Prescribed Schedule on the following pages (from Radiation Control Regulation 1993).

The **specific activity ratio** is calculated using the expression:

$$\text{Specific activity ratio} = SA1 + (SA2 \times 10^{-1}) + (SA3 \times 10^{-2}) + (SA4 \times 10^{-3})$$

where SA1 to SA4 are the specific activity (of the material) of Group 1 to Group 4 radionuclides, as set out in Column 1 of The Prescribed Schedule on the following pages (from Radiation Control Regulation 1993).

Once the above is achieved for all radioactive waste then refer section 3.3.3 for the documentation and procedures for notification and disposal. On the documentation the classification of the waste (hazardous, industrial and no radioactive) must be clearly indicated.

In Addition the following also applies:

- i) A Radiation Waste Store may be a suitably labelled and shielded locked cupboard within the Radiation Facility. Secondary containers or trays should be used for all liquid wastes.
- ii) Waste requiring professional disposal or storage for an extended period prior to disposal should be stored in the Radiation Waste Store. Each item stored must be identified (see point vi) and details entered in the register.
- iii) To reduce waste disposal costs via commercial disposal, minimise the quantities generated. If waste will decay sufficiently for processing by an ordinary clinical waste contractor within a few months, solid (eg: gloves, tissues, some plastic ware) and aqueous waste, should be stored in the Radiation Waste Store.
- iv) The generator is responsible for ensuring any stored waste is marked with the International Radiation Symbol, the RSC number, his/her name, name of the nuclide, activity, date (see clause (vi) below), and that it is disposed of after checking levels of activity with the appropriate monitor and doing the appropriate calculations as required by the legislation. The RSC must be notified of disposal, and it must be noted in the register in the laboratory.
- v) Non-Aqueous (Organic) Liquid Waste cannot be disposed of in the sewerage system. Organic liquid waste should be poured into a designated container in the Radiation Room. Care needs to be taken to ensure that incompatible chemicals are not mixed. The container must be marked with each different organic liquid added and the various contaminating radionuclides indicated. Indiscriminate mixing of separate wastes is not recommended and increases disposal costs. The generator of the waste must arrange for its safe storage in the Radiation Waste Store, until such time as it is able to be disposed of via an accredited waste contractor.
- vi) At the point of generation, Solid Waste must be separated into high and low activity waste. Any glassware or other utensils that are to be reused should be immediately soaked in a decontaminating solution. Solid Waste giving reading on an appropriate monitor that equates to approximately 100 Bq/g

can be considered as low level waste. When it falls **below** this level of activity, the low level waste may be disposed of in sturdy, plastic-lined containers (**without radiation labelling**) via an accredited waste contractor. Any solid radioactive waste must be placed in a sturdy, plastic lined container, able to be sealed for transport and labelled with:

International Radiation symbol

User Name Responsible

Date

Type of Nuclide

Level of Activity

RSC number; whereupon it may be disposed of via an accredited waste contractor.

(**NB:** These labelling requirements are equally applicable to stored aqueous waste).

Nuclides that have short half lives would allow decay to a level permissible for disposal. The generator is responsible for ensuring that disposal takes place after checking with a monitor. Bags of waste must be removed from the Radiation Room by the generator of the waste.

All material deposited in the Radiation Waste Store must be noted on the register. If it is removed at a later date for disposal, then this fact should be noted next to the entry in the Register and a line marked through the entry.

3.4 PURCHASING/OBTAINING IRRADIATING APPARATUS

Prior to any irradiating apparatus, as defined under the Radiation Control Act (NSW) 1990, being brought into Charles Sturt University, approval by the Radiation Safety Committee **must** be obtained.

This includes purchases and any other means of acquiring the irradiating apparatus, such as through loans or donations from other institutions.

To obtain RSC approval for purchasing / obtaining irradiating apparatus:

- obtain a copy of Form **RSC 2**, Application to Purchase / Acquire Irradiating Apparatus. This can be found as Appendix 3 or can be downloaded from the Web at: http://www.csu.edu.au/acad_sec/committees/radiation/rsc_forms_resources.htm
- complete and forward Form RSC 2 to the Radiation Safety Committee together with a copy of the Purchase Requisition, or the Purchase Requisition Number (if required);
- on receipt of approval, forward this with the purchase requisition to the Purchasing Officer;
- notify RSC of arrival of apparatus.

3.5 RADIATION ACCIDENTS, INCIDENTS AND EMERGENCY RESPONSE

3.5.1 Scope

The following emergency procedures apply to all laboratories and other areas where unsealed ionizing radioactive materials are used within Charles Sturt University and apply to all staff, students and visitors.

3.5.2 Definitions

Accident or Incident An accident or incident is defined as any uncontrolled or non-approved release of radioactive material into the environment, or contamination of personnel.

Major Spillage A major spill is defined as a spillage equal to or greater than that level listed for the radioactive substance in Schedule 1 of the Radiation Control Act (1990) and Regulation (2003) if wet, and 1/10 of this level if a dry powder and any release of a gaseous or volatile radioactive substance.

Minor Spillage A minor spill is defined as any spillage where the activity is less than that of a major spill and only a small radiation or contamination hazard to personnel exists.

(Note: See TABLE 1 'PROPERTIES AND SPILL CRITERIA OF SOME COMMONLY USED RADIONUCLIDES', in the Appendix 1 to this Manual.)

3.5.3 Reporting of Accidents and Incidents

All radiation workers shall ensure that accidents, incidents and emergencies involving ionising radiation are reported, either directly or indirectly through their supervisor, to the Radiation Safety Committee.

In the event of a minor spillage, a report, using the **CSU Accident/Incident Form** (**NB:** This form has replaced form RSC 8) <http://www.csu.edu.au/division/healsafe/textdocs/forms/AccIncReport.doc> should be made *after the spill has been cleaned up and the area decontaminated*. The report should include the location of the incident, the nuclide involved and its chemical form and the activity spilt.

In the event of *a major spillage or where personnel have been contaminated*, the report must be made immediately to **one of the emergency response numbers listed below**. This immediate notification can then be followed up within 24 hours using **CSU Incident/Accident Form**.

All accidents involving injury or contamination to staff, students or visitors must be reported to the Human Resources Office immediately, and then followed up with the **CSU Accident/Incident Report Form**.

3.5.4 Location of Emergency Radiation Spill Kits

The Emergency Radiation Spill Kits are located in the following rooms on the Wagga Wagga Campus:

- Room. 224 Building 10 (David Morell Laboratories);
- Room. 136 Building 268 (Sutherland Laboratories).

3.5.5 Emergency Response Contact Numbers:

Security	After Hours/24 Hours
Bathurst	633 84999
Orange	636 57522
Wagga Wagga	693 32288

*For all critical incidents: call Security immediately.
Internal Shortcut dial "400"*

3.5.6 Procedure for Minor Spillage

In the event of a minor spillage, the operator **wearing appropriate PPE (e.g. laboratory coat, face mask, safety glasses and gloves)** shall proceed as follows:

Wet Spill

1. Monitor the spill area and define the extent of the spill.
2. The liquid should be absorbed by paper towelling, tissues or similar material.
3. Wash with water and dry with paper towelling or similar material.
4. Monitor the spill area. If effective, repeat until the affected area has returned to background and go to step 7. If ineffective, go to step 5.
5. Wash with suitable detergent and dry with paper towelling or similar material.
6. Monitor the spill area. If effective, repeat until the affected area has returned to background and go to step 7. If ineffective, do not attempt further decontamination. Isolate the affected area by erecting a temporary barricade and contact a member of the Radiation Safety Committee on one of the Emergency Response Contact Numbers.
7. Report the incident to the Radiation Safety Committee using CSU Accident/Incident Report form (<http://www.csu.edu.au/division/healsafe/textdocs/forms/AccIncReport.doc>)

All materials used in cleaning and decontamination must be placed in suitably-labelled receptacles and stored for disposal.

Dry Spill

1. Monitor the spill area and define the extent of the spill.
2. Carefully wipe up the material with paper towelling or tissues moistened with water.
3. Wash with water and dry with paper towelling or similar material.

4. Monitor the spill area. Repeat until the affected area has returned to background.
5. Report the incident to the Radiation Safety Committee using CSU Accident/Incident report (see point 7 above).

Care must be taken to prevent the generation and inhalation of any generated aerosol or dust materials.

All materials used in cleaning and decontamination must be placed in suitably-labelled receptacles and stored for disposal.

After completion of all decontamination operations, the area must be checked with radiation monitoring equipment, or in the case of ^{14}C and ^3H , with a standard wipe test.

3.5.7 Procedure for Major Spillage, Personnel Contamination or Other Emergency

In the event of a major spillage, contamination to personnel or other emergency situation (e.g. fire), the following procedures shall be followed:-

1. In the case of a Major Spillage, the immediate emergency actions are as follows :
 - The laboratory or area shall be evacuated at once but contaminated persons should not proceed far into an inactive or safe area until they have been monitored.
 - If safe to do so, turn off all laboratory services including fume cupboards and close all doors and windows.
 - Isolate the affected area by erecting a temporary barricade and the placing of radioactive warning signs.
 - Immediately report the situation to a member of the Radiation Safety Committee on one of the Emergency Response Contact Numbers. It is the responsibility of the University to report the incident to the Department of Environment and Conservation (DEC) within 24 hours of being notified. At this time the DEC may take complete control of the situation and site.
 - **Do not attempt to decontaminate the area. Leave this to members of the Radiation Safety Committee or appropriate emergency services who have been especially trained to deal with the situation.**
 - The treatment of serious injury must take precedence over decontamination and containment.
 - Normal work must not be resumed until the relevant Government Authority (NSW DEC) and/or Radiation Safety Committee is satisfied that it is safe to do so and has given its approval.
2. In the case of Personnel Contamination, the immediate emergency actions are as follows :
 - Remain in the radiation laboratory or area and call for assistance. Do not leave the work area and risk spreading contamination.
 - Monitor the whole body and clothing using a suitable contamination monitor.
 - If skin or eyes are contaminated, wash under running water until assistance arrives.

- If clothing is contaminated, remove garments and leave in work area. Do not proceed far into an inactive or safe area until being monitored.
- The treatment of serious injury must take precedence over decontamination and containment.
- Immediately report the situation to a member of the Radiation Safety Committee on one of the Emergency Response Contact Numbers.

3. In the case of Fire, the immediate emergency actions are as follows:

- Rescue any persons in immediate danger.
- Raise the alarm, warn other workers in the area and begin building evacuation
- Contact the Emergency Services by phoning (0) 000.
- Contact the Radiation Safety Committee by phoning one of the Emergency Response Contact Numbers.
- Contact University Security by phoning: Wagga Wagga 693 **32288**. or Bathurst 633 **84999**.
- Obtain the Radioactive Substances, Dangerous Goods and Hazardous Substances Inventories for the facility to present to the Emergency Services.

Attempt to extinguish the fire with hand-held appliances only if you have been trained in their use and it is safe to do so.

4. In all other situations, the immediate emergency actions are as follows:

- The laboratory or area shall be evacuated at once.
- Initiate the facilities emergency response procedure for situation.
- Immediately report the situation to a member of the Radiation Safety Committee on one of the Emergency Response Contact Numbers.

NOTE: If there is any doubt concerning the above procedures, advice and rulings should be sought from the Radiation Safety Committee.

Basic First Aid

Note: All materials listed below should be stocked in the Radiation Room.

In the case of an accident involving radioactive material, the following simple First Aid Instructions may be found useful:

Radioactive material in the eyes or nose - solid or liquid. Irrigate with saline (0.9 per cent common salt solution). If this solution is not available, use tap water. Care must be taken to avoid swallowing contaminated material.

Radioactive material on:

- Skin** - (i) Brush lightly with soap and water.
(ii) If this fails, a paste of Fuller's Earth or Kaolin may be applied and subsequently washed off with soap and water.
(iii) If this fails, try EDTA solution (a chelating agent) with gentle sponging or rubbing to ensure that the skin is not broken.

- (iv) As a last resort, immerse the hands or swab affected skin in saturated potassium permanganate solution, rinse in water and remove stain with 5 per cent solution of sodium bisulphate.

Mouth - Wash out with hydrogen peroxide solution (1 tablespoon full of 10 volume hydrogen peroxide to a tumbler of water) several times.

Contamination of a wound:

Wash under a tap with copious quantities of water and encourage bleeding. If the wound is on the face, take care not to contaminate the eyes, mouth, or nostrils. Next, wash the wound with soap and water and apply disinfectant and first aid dressing.

Maximum permissible level of skin contamination for Beta activity is 4kBq/cm² (averaged over 100 square cm).

NB: All accidents involving contamination of personnel must be reported immediately to the Radiation Safety Committee and to the Division of Human Resources.

All material used in decontamination or treatment of an injury must be collected and bagged and labeled for disposal once treatment has been completed.

3.6 PERSONAL MONITORING OF STAFF AND STUDENT AT CSU

The monitoring for radiation exposure of Charles Sturt University staff and students, as prescribed by the Radiation Control Regulation (NSW) 1990, is the responsibility of the School / Centre to which the staff member or student is attached. The costs involved with such monitoring shall be the responsibility of the School / Centre. The maintenance of central records will be carried out by the Radiation Safety Committee (RSC).

Schools or Centres that employ or teach students that are required to be monitored⁴, shall provide the student with a copy of their responsibilities as wearers and contact details for the committee to enable them to request, at any time, a copy of their accumulated dose. Students will only receive a copy of their accumulated doses upon request. Requests can be made in writing or electronically via the details below. Students should state their full name, postal address and student number as part of the request.

Contact details

Post:

Executive Officer
Radiation Safety Committee
Office of Academic Governance
Charles Sturt University
Private Mail Bag 29
BATHURST NSW 2795

Email:

radiationsafety@csu.edu.au

The Executive Officer of the RSC shall forward a list of all staff being monitored to the Division of Human Resources quarterly, so that their files can be flagged as radiation workers. Human Resources shall notify the RSC when these persons depart the University, so that copies of their final dosimetry reports can be provided to the Division of Human Resources for forwarding to staff.

The RSC requires the records of dosimetry readings for staff and students for any or all monitoring periods together with the latest total accumulated dosimetry readings. These records are to be forwarded to the Executive Officer of the RSC as soon as possible after receipt by the School/ Centre.

3.6.1 Approved Personal Monitoring Devices

The main type of personal monitoring device used at the University is the *Thermoluminescent Dosimeter*, colloquially known as a TLD Badge, which is recommended for use by those exposed to x-rays, beta rays, or a mixture of these (TLD cards for these badges are typically issued for 12 week periods).

The *Neutron Badge* may be used by those using moisture density gauges (neutron moisture gauges) (TLD) cards for these badges are also issued for 12 week periods). *Finger sachets* may be used by those whose hands are working very close to

⁴ Any students who may have potential exposure to ionising radiation in the course of their studies shall be monitored.

radioactive sources (cards for these devices are issued for 4 week periods).

3.6.2 Dosage Limits

ARPANSA recommends that the annual dose received by radiation workers should not exceed 100 millisievert (mSv), averaged over 5 years, with no more than 50 millisievert in any one year, provided that the 5 year period averages out to less than 100 mSv. By the continual wearing of monitoring devices, it is possible to determine the annual dose received by each individual and to ensure that the recommended are not exceeded (ARPANSA).

3.6.3 Responsibilities of the Centre Manager

Each designated Centre Manager shall ensure:

- that each wearer is made aware of their responsibilities, as outlined below;
- that each wearer is instructed in the correct care and appropriate wearing of the monitor issued to them;
- that all TLD cards are exchanged after the appropriate wearing period and the exposed cards returned to the Monitoring Service for reading;
- that wearers are provided with copies of their cumulative dose at least annually (together with an explanation of the dosage limits), and on receipt of any abnormal findings;
- that dosimetry reports are maintained and copies forwarded to the Executive Officer of the RSC (see above);
- that all monitors are stored appropriately (see *Procedures for the Storage of Personal Monitoring Devices and Laboratory Coats*); and
- an RSC accident incident form (RSC 8) must be submitted for any lost or non-returned personal dosimeters, highlighting the circumstances behind the non-return and clearly identifying all possible potential exposures during the monitoring period.

3.6.4 Responsibilities of Wearers

Each wearer of a monitor shall:

- wear the device whenever they are using ionizing radiation or working in a radiation facility (that is at all times whilst in the radiation facility);
- wear the device in the appropriate position on the body for the type of work being performed;
- store the device appropriately (see *Procedures for the Storage of Personal Monitoring Devices and Laboratory Coats*);
- always wear their own device;
- only wear the device for the appropriate period before exchanging the TLD card for a new one (and ask the supervisor to return the exposed card to the Monitoring Service for reading);
- take care not to damage the device or carelessly expose it to extraneous radiation;
- do not tamper with, expose to heat or water, or fraudulently expose the TLD;
- do not wear the TLD when undergoing medical procedures (including dentistry);
- report any known exposures, loss of TLD, change in radioactive source usage, or any other information which could affect the TLD reading to the supervisor

immediately; and

- a CSU Accident/Incident form (<http://www.csu.edu.au/division/healsafe/textdocs/forms/AccIncReport.doc>) must be submitted for any lost or non-returned personal dosimeters, highlighting the circumstances behind the non-return and clearly identifying all possible potential exposures during the monitoring period.

(See also clause 3.1.1 of the *Responsibilities of CSU Staff Who Supervise Other Staff and Students*).

3.6.5 Storage of Personal Monitoring Devices and Laboratory Coats

The following Procedures for the Storage of Personal Monitoring Devices and Laboratory Coats (upon completion of each day's work in a Radiation Facility) shall be followed:

- Personal Monitoring Devices shall be stored in the drawer of a desk or a suitable, purpose-built storage facility located outside the Radiation Facility, and well away from all radioactive sources or exposure from ionisation sources (irradiating apparatus); and
- Laboratory Coats shall be stored within the Radiation Facility, on hooks immediately to one side of the door.

3.6.6 High Dose

Definition

In order to define the term high dose the following regulatory policies on dosimetry limits of radiation exposure for Australia need to be referred to:

- The annual limit of exposure for **a member of the public** is 1mSv.
- The annual limit of exposure for **a worker** is 50mSv.
- The mean limit of exposure for **a worker** is 20mSv *over 5 years*.

However please note; the realistic annual limit for the occupationally exposed workers is 20mSv, and that there are other operational factors that come into effect.

The old legislation (RSA 1954 and RSR 1957) contained a clause that ensured that doses that reached 30% of the annual limit were reported in writing to the relevant government authority (annual dose limit at that time was 50 mSv). In addition the Australian Standard has recommendations relating to 30% of the annual limit. The EPA (DEC) still uses the 30% reporting limit. Also all personal dosimetry results must be lodged with ARPANSA to be included in the national dosimetry database. In doing so ARPANSA classifies each worker in terms of the work being done with each individual's results being lodged with all other reports of similar workers. In doing so, each individual dose report is compared to that classification's average and if that individual dose report is "significantly" above the average then this is "flagged" to the relevant state government body for action.

As such from the above dissertation the EPA (DEC) actions such reports by requesting either an informal report on the "high" dose, or a formal report/investigation in which case the worker is usually not allowed to continue

doing the radiation work until such time as the EPA(DEC) is satisfied with the investigation and subsequent report.

The Radiation Control Section of the New South Wales Environmental Protection Authority (EPA) requires notification of any dose exceeding:

- 400 μ Sv per week.
- or
- 5.2mSv over three (3) months.

Radiation monitoring services companies in Australia notify individuals of any dose that exceeds 0.50 mSv* per wearing month.

Reporting Mechanisms

A three-tiered approach is proposed to identify what cause of action is to be taken at what degree of radiation exposure recorded (see Table 2). Based on average laboratory doses.

Monthly	0.25 to 0.4 mSv	Immediately investigate the circumstances concerning the receipt or possible receipt to the dose and place a report on the students/staff members file.
3 Monthly	0.4 to 0.6 mSv	
Monthly	0.4 to 0.8 mSv	Immediately investigate the circumstances concerning the receipt or possible receipt to the dose and report in writing to the RSC within 7 days of discovery of the dose.
3 Monthly	0.6 to 1.5 mSv	
Monthly	>0.8 mSv	Immediately report all facts concerning the receipt or possible receipt of the doses to the RSC.
3 Monthly	>1.5 mSv	

Table 2 *The action to be taken in the incident of a high radiation dose recording from a personal TLD recording device.*

The reporting of a “high” radiation recording on a TLD device will take place in the following form:

1. Notification of a “high” dose report from the radiation monitoring Service Company.
2. Notification in writing to the RSC (CSU Accident/Incident report (<http://www.csu.edu.au/division/healsafe/textdocs/forms/AccIncReport.doc>) including a copy of the notification notice (from point 1).
3. Notification to the relevant individuals This may include:
 - a. the individual to whom the report relates to[#].
 - b. Facility Manager[#]
 - c. Head of School
 - d. Course Coordinator
 - e. Clinical Coordinator

[#] These reports will request a response as to why these recording may have occurred and may request that the individual undertake counseling as to their practices etc.

Repeated reports for an individual and or for individuals from a facility

It is recommended that those individual(s) or facility be notified immediately and a request made that they cease all use of radiation from the time of notification until a proper assessment or safety audit be undertaken of equipment, practices and facilities. Re-commencement should not be undertaken until all factors have been addressed to the satisfaction CSU Radiation Safety Committee.

Distribution Recommendation

A copy of the “High” Dose Procedures policy will be forwarded to :

- Relevant Heads of Schools;
- Facility Managers and/or individuals responsible for the organisation, distribution and return of TLD for staff/students of Charles Sturt University;
- Relevant Course Coordinators; and
- Relevant Clinical Coordinators (for inclusion in clinical placement documentation).

3.7 CLEARANCE PROCEDURES FOR MAINTENANCE WORK TO RADIATION FACILITIES AND FIXTURES

Prior to any maintenance work being carried out in a Radiation Facility, either to the facility itself, to the fixtures within the facility or associated services, *written clearance* must be obtained from the appropriate Facility Manager.

This clearance shall be provided using a duly completed copy of Form **RSC 12**, which is located at Appendix 12 of this Manual or can be downloaded at the following Web address:

http://www.csu.edu.au/acad_sec/committees/radiation/rsc_forms_resources.htm

As well as certifying that the particular facility is safe for entry, the letter shall also indicate that basic instruction in radiation safety has been provided by the Facility Manager.

A copy of the clearance letter shall be retained by the Facility Manager for audit purposes.

3.8 QUALITY ASSURANCE PROCEDURES

The Australian University Quality Agency (AUQA) established by the Commonwealth and State Governments, will be conducting quality audits of all public-funded higher education institutions in Australia over the next few years. Charles Sturt University must have an effective, documented quality assurance processes in place. It is *especially important* for facilities where unsealed radioactive sources are being used and/or stored to have a Quality Assurance Program.

The University *Radiation Safety Manual* contains guidelines, procedures and policies which are designed to ensure that radiation safety at the University is maintained at all times. *Verifying* that these policies and procedures are being complied with, through regular auditing, is an important quality assurance role of the Radiation Safety Committee.

3.8.1 Radiation Safety Committee

(i) Auditing

Radiation Facilities

The Radiation Safety Committee will conduct an internal audit of all radiation facilities at Charles Sturt University **annually** to ensure that all the minimum standards and radiation safety requirements outlined in the relevant Australian Standard (AS 2243.4 – 1998: “Safety in Laboratories – Ionizing Radiations”), and elsewhere in this Manual, are being complied with. (The University will employ an external consultant periodically to conduct an *independent* Radiation Laboratory Safety Audit, and to provide a full report to the Committee on compliance with safety standards. During years in which an external audit is being conducted, the internal audit shall be dispensed with, unless the situation warrants it).

Internal audit reports shall be prepared and considered by the Radiation Safety Committee; recommendations for improvement shall be forwarded to the respective Heads of School and Facility Managers for action and to the Academic Secretary for information.

Ad hoc inspections of radiation facilities shall be conducted whenever the situation warrants it.

All audit reports shall be maintained by the Executive Officer of the Radiation Safety Committee and made available to the NSW Environment Protection Authority (EPA) if required.

Laser Facilities

The Radiation Safety Committee shall conduct an initial internal audit of all facilities storing laser apparatus (other than laser pointers) to ensure compliance with the Laser Safety Policy.

Once the class of laser apparatus has been confirmed in the initial audit, facilities storing only Classes 1 and 2 laser products shall be exempted from future audits. **Facilities storing Classes 3 and above laser apparatus shall be audited annually.**

Audit reports shall be prepared and considered by the Committee; recommendations for improvement shall be forwarded to the relevant Heads of School/Centre Directors and Facility Managers for action and to the Academic Secretary for information.

Facilities Storing Radiation Emitting Soil Density and Moisture Gauges

The Radiation Safety Committee shall conduct an **annual** audit of all facilities storing Radiation Emitting Soil Density and Moisture Gauges, consider audit reports and forward recommendations for action (if required).

(ii) Maintenance of Registers

The RSC shall maintain Registers of all Licence Holders, Radioactive Substances and Irradiating Apparatus, Laser Users and Laser Apparatus (other than laser pointers) used and stored at the University.

The Registers will maintain their currency by distribution of copies of the Register of Licence Holders Form (**RSC 3**), Register of Irradiating Apparatus Form (**RSC 4**), Register of Radioactive Substances Form (**RSC 5**), Laser User Registration Form (**Laser 1**) [for the registration of Class 3B and above users only], and Laser Apparatus Registration Form (**Laser 2**) to all relevant Schools, Centres and Divisions at the University **annually, in October each year.**

The completed forms will be reconciled with relevant reports from the Radiation Database and following discussion at a Radiation Safety Committee meeting and consultation with facility managers, if necessary, the Registers (database) will be updated accordingly.

(iii) Advice to University Security/Emergency Services

Following the annual update of the Radiation Registers, a 'report' of the latest Register of Radioactive Substances stored in each of the University Radiation Facilities shall be forwarded to University Security, along with Emergency Response Contact Details.

These lists and contact details shall be retained in a safe place by Security and made available to Emergency Services (particularly the Fire Brigade) in

the event of an accident or incident in any of the Radiation Facilities at the University.

(iv) Maintenance of Personal Radiation Monitoring Records and Provision of Final Dosimetry Reports

The RSC shall maintain a Register of all Dosimetry Reports from Personal Radiation Monitoring Devices worn by radiation users at the University, and shall provide final dosimetry reports to all such users (whether they be students or staff) when they depart the University, as required by the Radiation Control Regulation (NSW) 2003. Copies of these final dosimetry reports shall be retained by the RSC for inspection by the EPA if required.

Electronic records are received regularly from the TLD service providers which are imported into the University's Radiation Database. As an additional quality assurance procedure, the Executive Officer of the RSC will manually check all entries once the paper dose report forms are forwarded from each of the facility managers.

To ensure that the RSC is notified of all *postgraduate students* proposing to undertake research involving the use of radioactive substances and/or irradiating apparatus (so that they can be added to the Register and provided with final dosimetry reports upon graduation or departure from the University), the Executive Officer will send an electronic mail message to all University Research Higher Degree Supervisors **in February and July each year** to remind them of the notification and monitoring requirements for such students.

Schools and Centres are responsible for advising the Student Administration Offices of any occupationally exposed persons (requiring monitoring), but this requirement often translates into notification of *undergraduate students*. The message to supervisors above is an additional quality assurance measure to ensure that all postgraduate radiation workers are notified to the RSC.

The RSC shall provide **quarterly** updates of all *staff* using radiation to the Division of Human Resources to enable them to flag files of radiation workers, to ensure the provision of final dosimetry reports when staff members depart the CSU.

(v) Development and Circulation of Radiation Safety Policies, Procedures and Guidelines

The RSC is responsible for producing and circulating, a *Radiation Safety Manual* incorporating guidelines, policies and procedures in relation to the acquisition, handling, storage and disposal of radioactive substances and irradiating apparatus, and the safe use of non-ionising radiation, at CSU.

The following procedures shall be followed to ensure that amendments and additions to the Manual are approved in the required manner and circulated to all Radiation Users at CSU:

- *Substantial amendments to guidelines and procedures* (and minor amendments to policies) will be discussed by the RSC and forwarded to the Academic Secretary for approval, prior to incorporation into the electronic version of the Radiation Safety Manual on the Web;
- *Minor amendments to guidelines, procedures and forms* will be approved by the Radiation Safety Committee;
- *Substantial amendments to policies* will be discussed by the RSC and forwarded to the Academic Secretary *for transmission to the University Council* for approval, prior to being incorporated into the electronic version of the Manual on the Web;
- The Executive Officer will notify all Radiation Users of any changes to the Manual approved by the Committee, the Academic Secretary or the Council during the year, following each meeting, and shall advise them that the up-to-date, amended version of the Manual is available electronically at the link on the Committee's Home Page on the Web; and
- The Executive Officer will ensure amendments to the Manual are circulated to all Facilities at the University and that the current manual is always available on the Radiation Safety Website.

(vi) Assessment of Safety Implications of Proposed Research and undergraduate teaching involving Radioactive Substances and/or Irradiating Apparatus

All students proposing to undertake research or staff conducting undergraduate teaching involving the use of radioactive substances and/or irradiating apparatus must complete the "Proposal to Undertake Research or Undergraduate Teaching which Involves the Use of Ionising Radiation" Form (**RSC 6**) and submit it to the Committee for an assessment of the radiation safety implications of the proposal. This is a requirement of the University's "Code of Conduct for Research".

Following consideration of such proposals, the Executive Officer will notify the relevant Student Administration Office of the student name so that they may flag the file as a radiation worker (for later notification to the Committee when the student departs the University). The assessment procedure acts as a further quality assurance process in helping to identify radiation workers so that the statutory obligation to provide final dosimetry reports can be met.

(vii) Calibration of University Spill Kit Radiation Monitors/Auditing of Spill Kit Contents

The RSC will ensure that the two University Spill Kit radiation monitors are calibrated **annually, and following any repairs**. Records of dates and results of all such calibrations will be maintained by the Committee. The RSC will conduct an inspection of the spill kit contents **every three months**, and submit copies of reports to the Committee for noting.

3.8.2 Quality Assurance Responsibilities of Heads of School/Centre Directors/Radiation Facility Managers

Heads of School, Centre Directors, Radiation Facility Managers and other appropriate supervisors shall be responsible for conducting the following *facility-specific* quality assurance procedures, which must be fully documented and available for future audits and/or EPA inspections:

- Measurement of radiation dose rates, **at least once per month**, on the external surface of any store containing radioactive materials;
- Radioactive contamination on all surfaces within each facility shall be monitored **at least once per week** (when the facility is being used), and decontamination carried out if necessary;
- Calibration of radiation monitoring instruments shall be undertaken **annually, and again following any repairs**;
- *Prior to any Maintenance Work being undertaken* within or to a radiation facility, written clearance shall be provided (which will include a statement indicating that basic radiation safety instruction had been imparted);
- Student Administration Offices shall be advised **annually** (name, student number and course) of all students required to wear personal monitoring devices when working in each facility, to assist in the provision of final radiation dosimetry reports;
- Wipe tests of the source and source assembly of all radiation emitting Soil Density and Moisture Gauges, and calibration of the instruments, shall be conducted by a competent licensed serviceman, **at least annually**; and
- Moisture Gauge Authorised User Logs (Form **RSC 11**) and Moisture Gauge Usage Log Records (Form **RSC 10**) shall be completed **after each use**, and stored close to the gauges where they are available for future audits.

3.9 Signage Requirements

All radiation facilities at Charles Sturt University must comply with the radiation warning signage requirements outlined in the latest version of the Australian Standards AS 2243.4 Safety in Laboratories – Ionizing Radiations and AS2983.1 Laboratory Design and Construction – General Requirements.

In summary, a *warning sign* must be displayed at the entrance to each Designated Radiation Area (DRA). It shall include:

- The ionising radiation trefoil symbol (coloured black) on a yellow background;
- The premise classification (as per AS 2243.1);
- Name of occupier;
- A prohibition of all eating and drinking within the DRA;
- A limitation of access to authorised persons only;
- Advice on the personal protective equipment required; and
- The name(s) and telephone number(s) of a person/persons for after hours emergency contact.

Radiation warning signs (in the form of *radiation stickers*) shall also be clearly and permanently attached to accessible locations on:

- Drains used for the disposal of aqueous waste; and
- Ducting, fans, air cleaning systems and discharge outlets for airborne wastes.