Charles Sturt University

Radiation Management Plan

Booklet 6 - Radiation monitoring

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1. Background

Under clause 29 of the Protection from Harmful Radiation Regulation 2013, Charles Sturt University must ensure that individuals who are occupationally exposed to the use of ionising radiation as listed under this clause are issued with appropriate approved personal monitoring devices (PMD) for detecting and measuring cumulative exposure to ionising radiation. Under the regulation staff and students provided with monitoring are obligated to wear the device while involved in the occupational use of ionising radiation and the university is required to keep a record of exposure for each monitored individual to ensure that employee's annual dose does not exceed occupational dose limits.

2. Type of monitoring equipment

2.1 Personal Radiation Monitors

(a) All personal dosimeters shall be issued, processed and calibrated by a personal monitoring device (PMD) provider approved to do so by the NSW EPA.

(b) Body dosimetry devices are normally worn somewhere on the trunk of the body, such as a collar, lab coat pocket, waist, or on a lanyard. However, when working with distinct sources, the dosimeter should be placed in the area of the body most likely to receive the highest amount of radiation exposure.

(c) When not being worn, dosimeters must be stored in an area of low background radiation, such as an assigned locker or office desk drawer.

(d) Dosimeters **SHALL NOT** be taken home, except when students are preparing to commence an allocated clinical placement.

(e) The local area administrator responsible for a monitored School or Centre must keep the control monitor provided by the dosimetry service in accordance with their instruction. This will be an area of low background radiation levels, normally an office area.

Full details are included in the Personal Monitoring Devices – Radiation Safety Procedure, available on the CSU Policy Library.

2.2 Electronic Personal Dosimeters

Electronic Personal Dosimeters (EPDs) allow instantaneous measurement of the dose and dose rate. These are used in certain situations where it is necessary to continuously and immediately be able to determine the current accumulated dose. EPDs do not replace the normal personal monitoring devices but can be used in addition to them.

EPDs may also have an alarm operating on a dose rate threshold or an integrated dose threshold. If either alarm does activate it is an indication that the wearer is to immediately cease radiation work and to contact the Radiation Monitoring Unit. The Radiation Monitoring Unit or RSC will recommend an EPD to a staff member if electronic monitoring is required. The Local Area Administrator should contact the Radiation Monitoring Unit or RSC if it is believed that electronic monitoring is required.

2.3 Extremity Monitors

Plastic rings incorporating a radiation monitor are available for staff to request and wear if their hands are likely to be exposed to significant radiation exposure. The ring is normally worn on the index or middle finger of the hand that does the most holding (e.g., for a right-handed person that is usually the left hand) with the active surface on the palm side of the wearer's hand.

3. Personal monitoring requirements

The NSW Protection from Harmful Radiation Regulation 2013 lists those occupationally exposed persons for whom an employer must provide a personal radiation monitor. This includes those people using irradiating apparatus and radiation in the medium and high-level laboratory for research and teaching, as well as those people using soil moisture gauges, sealed source devices, and for clinical purposes. The Regulation also requires the employer to provide a copy of the employee's radiation exposure record to the employee when the employee leaves the employer's employment. In addition, the Code of Practice for Radiation Protection in the Medical Applications of Ionising Radiation (RPS 14) requires a personal radiation monitor to be provided to each occupationally exposed person (clinical) who is likely to be exposed to ionising radiation in excess of 1 mSv in any one year.

Personnel who are expected to receive greater than thirty percent of the annual recommended effective dose limit of 20mSv should be subject to continuous individual personal monitoring. If the radiation worker is already covered in the legislative list then this radiation worker MUST be issued with a personal dosimeter. Such a person is commonly referred to as an 'occupationally exposed person.'

3.1. Radiation Monitoring Unit and the Radiation Safety Committee (RSC)

The Radiation Monitoring unit, in co-operation with the RSC will:

- ensure that personal radiation monitors are provided to all appropriate occupationally exposed persons;
- maintain the personal dose records of these occupationally exposed persons;
- provide a radiation dose record on request from Human Resources, to be given to staff member when they cease to be employed by the organisation;
- advise on the selection of the appropriate personal dosimetry service; and
- notify the wearer, supervisor, and RSC when a high dose is recorded or when damage or loss of a monitor is reported by the wearer.
- ensure that the person issued with the device maintains diary record of exposure that can be reviewed when the dosimetry record is generated after the event.

The Radiation Monitoring Unit shall ensure that all dosimetry records and notices are stored centrally in a location accessible by the RSC, and kept for the required period of time.

3.2. Area Dosimeter Administrator

The School or Centre will appoint a Radiation Monitoring administrator (within Technical Support Unit - TSU). This local area administrator will:

- ensure where appropriate, that a personal monitoring device designated by the Radiation Monitoring unit, is obtained for each occupationally exposed person; and
- ensure that monitors are promptly sent for processing at the end of each wearing period.

The RSC should be notified of this person and keep an up-to-date list of persons appointed.

Personnel issued with a personal radiation monitor must:

(a) wear the monitor in a position appropriate to the work being undertaken

(b) wear the monitor at all times when working with ionising radiation or in the Designated Radiation Area, regardless of whether radiation work is being conducted or not.

(c) submit their monitor to their administrator for processing at the end of the wearing period – how long is this period? 3 months/6 months?

(d) leave their monitor at their place of work after-hours.

(e) Report immediately if lost or mis-placed to the administrator, who will then suspend all radiation activity, issue a replacement dosimeter, report to the dosimetry records.

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(c) Dosimeters **SHALL NOT** be taken home, except when students are preparing to commence an allocated clinical placement.

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4. Calibration and maintenance requirements

4.1. Calibration, Acceptance, and Tests of Radiation Apparatus

All diagnostic and interventional X-ray equipment used in NSW must be registered with the NSW EPA via inclusion in the Radiation Management Licence (RML) Schedule/Inventory. In order to be registered, the equipment must pass a series of compliance tests performed by a Consulting Radiation Expert (CRE) who has been accredited by the EPA for the particular class of equipment

(mammography, dental, general radiography, etc.). The requirements for compliance and registration are specified in NSW Radiation Guideline 6 – Registration requirements & industry best practice for ionising radiation apparatus used in diagnostic imaging.

All new X-ray equipment must be tested for compliance using the test protocols in part 6 of this guideline. Any deficiencies identified by the CRE must be corrected and retested by the CRE before the equipment can be used clinically.

Signage indicating date of last test, type of test, testing provider and results (either passed or failed), to be attached to the equipment and in an easily accessible and visual location.

Note: EPA registration will be for either 2 or 5 years. Equipment which produces relatively high doses, such as CT scanners, have a 2-year registration period, while low-dose equipment, such as bone densitometers, have a 5-year registration period.

4.2. Repair and Maintenance of Radiation Apparatus

Diagnostic and interventional radiation apparatus must only be repaired by qualified service engineers who possess a current radiation licence. Whenever the repair may have compromised the imaging performance of the equipment or any of the radiation safety features, the relevant compliance tests must be repeated and passed successfully before the equipment is reused clinically. If the x-ray tube is replaced, the full compliance tests must be performed and the Certificate of Compliance issued and retained by the RML Holder. Signage indicating date of last test, type of test, testing provider and results (either passed or failed), to be attached to the equipment and in an easily accessible and visual location.

Radiation apparatus must only be repaired by qualified service engineers who possess a current radiation licence. Whenever the repair may have compromised the imaging performance of the equipment or any of the radiation safety features, the relevant compliance tests must be repeated and passed successfully before the equipment is reused clinically. If an X-ray tube is replaced, full compliance tests must be performed and the Certificate of Compliance issued and retained by the RML Holder.

Providers must comply with CSU's contractor management, and provide copies of insurance certificates, licences and other relevant certifications of the entity and individual employees and sub-contractors.

The RML Holder must, following any repair, maintenance, or modification to radiation-producing equipment, or equipment containing radioactive source(s), that could impact radiation safety, ensure that:

(a) the operation of the equipment is re-assessed so that the radiation safety of patients, staff, and the public is maintained; and

(b) a radiation survey is conducted by an approved and accredited medical physicist/consulting radiation expert (CRE). See NSW EPA guidance for individuals qualified and accredited to assess ionising radiation apparatus or fixed radiation gauges.

5. Workplace surveys

5.1. Radiation Monitor/Survey Meters

A radiation monitor/survey meter is required to undertake radiation surveys. A survey meter is considered appropriate for use if it:

(a) has sufficient measurement range to measure ambient dose equivalent rates at least throughout the ranges of 0.5 μSv·hr-1 to 1 mSv·hr-1 from the radioactive sources used;

(b) continues to indicate, either visibly or audibly, when radiation levels exceed the maximum reading in any measurement range; and

(c) indicates the measured quantity with a measurement uncertainty not greater than ± 25% inclusive of uncertainty due to response variation with energy over the range of energies of the radiation to be measured.

Radiation monitor/survey meters must be calibrated annually at an appropriate calibration facility.

Documentation must be kept by the Principal Investigator or an assigned project or facility representative of all calibrations, problems, repairs, and services.

5.2. Radiation Testing and Area Surveys

Refer to RMP Section 6 for details on monitoring in areas where X-ray equipment is located and used.

(a) Surface contamination

(b) Select a portable detector and determine the following information about the detector:

- type,
- sensitivity, and
- efficiency.

(c) To scan the surface, hold the detector probe approximately 5 cm from and perpendicular to the surface and move the probe over the surface in a regular organised fashion to cover the whole surface of the structure.

(d) When a site of contamination is located, define the edges, or extent, of the spill and mark out the contaminated area using chalk or some other removable marker. Roughly estimate the activity of the spill, and then decontaminate as appropriate.

5.2.1 Storage locations

As above, and measure all external accessible surfaces of the storage location.

5.2.2 Area Monitoring

As above, but measure the dose rates in the general areas throughout the designated radiation area.

Signage indicating date, time and test or survey completed by, and due date for next test/survey must be displayed in the area adjacent to the equipment and in an accessible and visible location.