Health and Safety - Ionising Radiation Management Procedure

Section 1 - Summary

(1) This Procedure ensures that Victoria University (VU):

a. has a system established to eliminate or minimise risk of injury as far as reasonably practicable to all employees, students, contractors, visitors and volunteers from exposure to ionising radiation.
b. has a system established for minimising effective doses for all ionising radiation practices and use of radiation sources, that ensures compliance with current legislative requirements.
c. complies with the conditions of the Radiation Management Licence and current occupational health and safety and radiation legislation.

Section 2 - HESF/ASQA/ESOS Alignment

(2) HESF: Standard 2.3 Wellbeing and Safety

(3) Standards for Registered Training Organisations (RTOs) 2015 (Cth): Standard 8

Section 3 - Scope

(4) This Procedure applies to all staff, students, contractors and others who may be impacted by VU activities at workplaces under the management or control of VU.

(5) Note: Contractors have a responsibility to ensure that consultative arrangements are in place for their employees and their workers.

Section 4 - Definitions

(6) DXA – Is an X-ray Bone Densitometer that is intended to be used to provide an estimate of bone mineral density at various anatomical sites (Spine, Femur, Total Body, and Forearm).

(7) Ion – An ion is an electrically charged atom or grouping of atoms.

(8) Ionisation – The process by which a neutral atom or molecule acquires or loses an electric charge i.e. the production of ions.

(9) Ionising Radiation – radiation that produces ionisation in matter. Examples are alpha particles, gamma rays, x-rays and neutrons.

(10) OSL Monitor – An optically stimulated luminescence monitor that measures potential occupational doses from gamma radiation and x-rays.

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(11) Radiation – Is the process of emitting energy as waves or particles.

(12) Radioactive Material – Is any material that spontaneously emits ionising material e.g. a radionuclide.

(13) Radionuclide – Is an unstable nuclide that emits ionising radiation.

(14) Radiation Practice – Refers to any of the following activities:

a. procuring or selling a radiation source;
b. transporting radioactive material;
c. repairing a radiation source;
d. maintaining a radiation source;
e. managing or controlling the use of a radiation source;
f. disposing of a radiation source;
g. procuring or arranging research involving the irradiation of persons; and
h. any activity conducted in relation to a radiation source that may result in exposing a person or the environment to radiation.

(15) Radiation Source – Refers to the following:

a. unsealed laboratory radioactive material;
b. a radiation apparatus (e.g. x-ray machine), and
c. a sealed source apparatus.

(16) Sealed Source – Means radioactive material that is:

a. permanently sealed in a capsule; or
b. closely bound and in solid form.

(17) XRD – Is a diffractometer that is a measuring instrument for analyzing the structure of a material from the scattering pattern produced when a beam of radiation or particles (such as X-rays or neutrons) interacts with it.

Section 5 - Policy/Regulation

(18) Health and Safety Policy

Section 6 - Procedures

Part A - Roles/Responsibilities

Roles	Responsibility
Executives and Leaders (who have ionising radiation within their area of responsibility)	- Oversee the management of ionising radiation practices and compliance to current legislative requirements. - Support and endorse the implementation of this Procedure. - Provide resources to meet the conditions of VU's radiation 'Management Licence'.

Roles	Responsibility
Principal Researchers	- Ensure that all research work is conducted in line with the principals of radiological protection i.e. justification, limitation and optimization. - Ensure that a risk assessment and safe operating procedure (SOP) is completed and appropriate controls for each research project are in place prior to commencement of the activities. - Oversee research activities in order to reduce radiation exposure to a level as low as reasonably achievable (ALARA).
Radiation Safety Officer (RSO)	- Provide advice associated with the use, storage, disposal and transport of ionising radiation sources in line with legislative requirements. - Maintain the VU radiation 'Management Licence' and 'Ionising Radiation Management Procedure'. - Lead investigation of radiation incidents and notify the relevant authority as required by legislation. - Procure personal radiation monitors and maintain and review radiation dose report results. - Develop and update radiation documentation as required. - Provide and/or organise radiation training as required. - Conduct and/or organise safety audits of radiation facilities as required.
Laboratory Technical Manager and Technical Staff	- Oversee and manage activities within the laboratory to ensure compliance with legislative requirements. - Facilitate laboratory induction and training for users, contractors & visitors as required. - Maintain training and induction records. - Notify RSO of any incidents involving radiation safety. - Conduct regular inspections of the laboratory to review compliance with laboratory radiation safety plan and manual. - Maintain a 'Plant and Equipment' Register for all radiation apparatus. - Provide and maintain safety and personal protective equipment (PPE). - Assist radiation users to conduct work safely in the laboratory.
Radiation Users (e.g. Research Officers/Post Doctorate and PHD Students)	- Follow radiation laboratory safety procedures and guidelines. - Maintain a record of all radioactive sources used. - Conduct radiation monitoring of work areas. - Ensure that a risk assessment and safe operating procedure has been completed and reviewed prior to commencing work with radiation. - Report any incidents (inclusive of spills), hazards or unsafe practices to the Laboratory Technical Manager.

Part B - Procedures

General

(19) This Procedure describes the Radiation Management Plan for all radiation activities conducted at VU. It provides the framework for the possession and safe use of ionising radiation. Supporting documentation includes the Radiation and DXA Safety Lab Manuals.

(20) All persons using ionising radiation sources and/or whom supervise radiation workers within areas where radiation sources are present and used at VU, are expected to be familiar with and follow the requirements of this Procedure at all times.

Radiation Protection Principles

(21) All radiation practices conducted at VU are to be in line with the three principles of radiation protection (as documented in the 'The Fundamentals for Protection Against Ionising Radiation RPS F-1' ARPANSA 2014):

a. Justification (that any activity involving radiation should do more good than harm);
b. Optimisation (that actual exposure, likelihood of exposures and number or exposed persons should be as low as reasonably achievable (ALARA), taking into account economic and societal factors); and

c. Dose Limits (levels of radiation dose that must not, under normal circumstances, be exceeded).

Radiation Management Licence

(22) VU holds a Radiation Management Licence (No.300042087) which is issued by the Department of Health (DH).

(23) Under this licence a specified list of radiation sources are documented which are authorised for use at VU.

(24) Approvals must be granted and the Licence updates prior to any radiation source/s being added or removed from a site. This includes:

a. the purchase of new radioactive apparatus or material;
b. the relocation of existing radioactive apparatus or material on campus; and
c. the removal of existing radiation apparatus or material from campus.

(25) If this requirement is not complied with then it is a breach of the conditions of the Licence and VU risks a potential fine and/or loss of Licence.

Legislation

(26) All radiation practices at VU must comply with relevant legislative requirements inclusive of the:

a. Radiation Act 2005 (Vic) (Victoria);
b. Radiation Regulations 2017 (Vic); and

any additional Code of Practice or other requirement as listed in the VU Radiation Management Licence.

Use Licence

(27) Use Licences are issued by DH. Unless exempted by the DH all users of radiation sources at VU must have a current radiation 'Use' licence.

(28) At VU At VU the following personnel are required to maintain a Use license:

a. Operators of the DXA (Footscray Campus)
b. Personnel handling unsealed radioisotopes in Rooms PB209D and PB209E (Footscray Campus)
c. Operators of the Vet Mobile X-ray Unit (Sunshine Hospital)

(29) The requirement for a Use license applies to both staff and students unless the student is working under the supervision of a staff member with a current Use license.

Records

(30) The Technical Manager and the RSO will ensure that current and accurate records of radiation documentation will be maintained inclusive of (but not limited to):

a. training records;
b. risk assessments;
c. dose reports;
d. monitoring records; and
e. audit results.

Audits

(31) A regular schedule of a radiation management system audit will be implemented at VU where radiation work is conducted as per below:

a. completed by an external auditor every 3 years; and
b. additionally the RSO will conduct an internal audit/check on radiation practises at least once annually.

Commencing Radiation New Work or Modifying Existing Practices

(32) Prior to any new radiation work commencing or a modification of existing work practices occurring at VU the following requirements need to be completed as per the following checklists:

a. Radiation Laboratory Induction Checklist;
b. DXA Research Project Checklist.

(33) Assistance can be sought from either the Technical Manager or the RSO.

(34) Any radiation source must only be used in the designated radiation work laboratory/areas established within the University.

Note: If any work is required outside of these areas then the relevant Technical Manager and the RSO must be contacted prior to commencement of work to conduct an assessment of these activities and provide approval for the works to proceed.

Procurement

(35) The procurement of a radioactive source must be within the scope of VU's 'Radiation Management Licence' and VU's purchasing procedure for chemicals, plant and equipment.

(36) For unsealed laboratory radioactive materials, only radioisotopes already listed on the VU Radiation Management Licence can be purchased. Quantities of radioisotopes held at VU must not exceed the quantities listed in the Licence.

(37) For any new (or additional) laboratory radioactive materials to be purchased the RSO must be contacted prior.

(38) Important: It is a legal requirement that the procurement of any new (and/or additional) radioactive sources within VU must not occur until the Radiation Management Licence is updated. Upon notification the RSO will contact the DH and submit a request to vary the licence authorising the newly purchased radiation source on the VU Radiation Management Licence.

(39) Once confirmation is received that the VU Radiation Management Licence is updated then procurement of the radiation source can proceed. For radiation apparatus and sealed source devices further notification of acquisition is required within 14 days of taking possession.

(40) The Radiation Management Licence must also be updated for the following activities at VU:

a. relocation of existing radiation sources; and
b. removal of existing radiation sources.

Training

(41) All employees, research and postgraduate students that work with radiation sources at VU must complete a relevant training course prior to the commencement of work.

(42) Specifically the following training is to be completed:

a. all VU employees/students working with ionising radiation must complete an appropriate 'Ionising Radiation Safety' training course;
b. all VU employees/students using the DXA machine without supervision must complete a training course approved by the relevant authority to obtain a 'User Licence' for medical radiography; and
c. the RSO is to complete specific RSO training as deemed appropriate for the role.

(43) In addition to the above all VU employees/students must complete a specific laboratory induction for entry into the Radiation Laboratory and DXA facility prior to commencement of work.

(44) Refresher radiation safety training is to be completed as a minimum every 3 years. (Note: not applicable to use of DXA.)

(45) Training can be organised by contacting the relevant Technical Manager or RSO.

Risk Assessments / Safe Operating Procedures (SOPs)

(46) A risk assessment is to be conducted for the following radiation activities at VU:

a. prior to commencing work using ionising radiation sources;
b. prior to the introduction of radiation apparatus; and
c. when changes occur to existing radiation processes and/or radiation apparatus.

(47) In each instance a new risk assessment is to be completed or an existing risk assessment reviewed and updated.

(48) All risk assessments are to be reviewed by the Laboratory Technical Manager and the RSO and approved by the Principle Researcher prior to the commencement of work.

(49) Risk Assessments should include (but not limited to) an assessment of the following:

a. radiation dose exposure from specific radioisotopes or apparatus;
b. the introduction of new radiation processes, apparatus and / or material;
c. PPE and shielding requirements; and
d. method of storage, waste and disposal.

(50) Risk Assessments are to be reviewed as a minimum requirement every 3 years and/or when changes to radiation work tasks or apparatus occur.

(51) The following risk assessment template is to be used HSW-F-002 OHS Risk Management Form.

(52) Following the completion of a risk assessment a Safe Operating Procedure must be completed for all ionising radiation activities at VU.

(53) The Safe Operating Procedure should include (but not limited to) to the following:

a. The controls identified in the risk assessment for the activity;
b. the wearing of applicable personal protective equipment (PPE);
c. instructions detailing the safe handling of the radiation source to prevent exposure;
d. the requirement for the use of hand-held and personal radiation monitor/s;
e. the requirement for shielding;

f. restricted access, including a list of authorised users who have undertaken the appropriate training;
g. completion of a log book to record and monitor the use of ionising radiation isotopes; and
h. waste requirements and clean-up of the work area.

Personal Dosimetry

(54) All individuals working or exposed to ionising radiation at VU must wear a personal dose monitor. An OSL Monitor is used. Monitors should be worn either at a waist or chest level attached to the body or belt garment.

(55) An OSL Monitor can be obtained by contacting the relevant Technical Manager or the RSO. Documentation must be completed and forwarded to the relevant authority via the RSO. Individual names will be specified on each monitor allocated.

(56) All VU radiation workers must only use the monitor that has been allocated to them and they must not be shared with other individuals.

(57) Monitors must only be used in authorised radiation areas and be returned after use to the monitor storage boxes which are provided.

(58) Visitors that enter radiation areas will be provided with a 'spare' monitor to wear whilst in those locations and return the monitor to the relevant Technical Manager once they leave the area.

(59) Monitors are collected and replaced with new ones on a quarterly basis by the Technical Manager and the RSO and sent to the OSL service provider for readout of the dose recorded.

(60) The RSO reviews monitor dose results. If dose results are indicating an upward trend towards the regulatory limit (as per the section below - Radiation Dose Limits/Exposure), or appear to be outside the expected 'dose' range of work conducted, then the RSO will inform the relevant Technical Manager and conduct an investigation into the specific radiation activity.

Radiation Dose Limits / Exposure

(61) In accordance with the Section 7 of the Radiation regulations persons should be protected from unnecessary exposure to radiation through the process of 'justification', 'optimisation' and finally 'limitation'. This will apply to occupational doses for all VU staff and research students.

(62) Assuming a practice involving a radiation source has been 'justified', 'optimisation' is achieved by keeping individual doses 'as low as reasonably achievable' commonly known as the ALARA principle. This is achieved by following the safety protocols outlined in this document.

(63) Additionally, the radiation regulations stipulate the following 'limitation' for an individual's annual whole-body radiation exposure in terms of effective dose:

a. 20mSv per year, averaged over a period of five consecutive years; and
b. 50mSv in any single year.

(64) Additionally when a pregnancy is declared by an occupationally exposed female at VU, the working conditions of the worker should be such as to ensure that the level of exposure does not exceed 1mSv for the remainder of the pregnancy. (Further guidance is documented in the Radiation Facility Manual).

(65) To limit the potential hazards of radiation exposure the following controls are to be administered in all radiation work activities:

a. Time,
b. Distance, and
c. PPE.

(66) An individual's total dose consists of the sum of the external exposure pathways plus internal exposures (primarily inhalation and ingestion). However, due to the low levels of radioactivity present with radioisotopes used and systems developed to minimise exposure to the lowest levels achievable radiation exposure is not expected to exceed 1mSV per annum. Hence at VU there is no requirement for calculation of internal doses.

Radiation Monitoring

(67) Contamination monitoring will occur in work areas at VU where unsealed radiation sources are used and will be conducted via the following methods:

a. use of a radiation hand held monitor, or
b. application of a swab test.

(68) Any hand-held monitor must be calibrated on an annual basis.

(69) Periodic area contamination of work areas at VU where radiation work is conducted must be taken (either using a handheld monitor or swab test) inclusive of:

a. work benches;
b. exterior of storage areas; and
c. exterior of apparatus.

(70) Records of radiation monitoring conducted at VU must be kept locally by the Technical Manager and be able to be produced either (via electronic or hard copy) upon request e.g. for audit purposes.

Note: Further information and instruction on radiation monitoring can be found in the 'Radiation Safety Lab Manual'.

Storage / Shielding

(71) Storage requirements for radioactive material at VU must take into account the following:

a. chemical properties;
b. radioactive properties; and
c. the level of risk associated with use.

(72) All radioisotopes must be stored in the designated fridge in the radiation lab.

(73) Access to storage areas where radioactive material is present at VU is restricted to authorized and trained staff and students only.

(74) The Laboratory Technical Manager is the only person able to issue authorisation for access.

(75) Shielding in laboratories/rooms specifically established for radiation activities has been determined and implemented by VU Facilities.

(76) Localised shielding is to be considered for individual radioisotopes as determined by the risk assessment and SOP.

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Labelling / Signage

(77) All radiation sources held at VU must be sufficiently labelled with a legible and durable label indicating as a minimum:

a. the name of the isotope;
b. the activity;
c. the date the activity was measured;
d. volumes / concentrations (where applicable); and
e. the responsible person.

(78) Locations within VU containing radioactive material and /or radiation apparatus must be clearly signed at entry points and clearly display:

a. the ionising radiation hazard symbol;
b. the words, CAUTION – RADIOACTIVE MATERIAL; and
c. the letters and symbol in black on a yellow background.

(79) Radiation apparatus must be clearly labelled with the following information:

a. the ionising radiation hazard symbol; and
b. the symbol in black on yellow background.

Incident Management / Emergency Procedures

(80) Any significant incident involving a radiation source at VU is to be immediately reported to the RSO and Technical Manager.

(81) The priority is always to isolate the area to prevent further radiation exposure and provide first aid or medical assistance to any affected person (if applicable) as required.

(82) Once the area is sufficiently contained and any affected persons (if applicable) have received first aid/medical treatment then the RSO will conduct an investigation of the incident.

(83) Based on the severity of the incident the RSO will make a determination whether the incident is required to be reported to the DH as per a stipulated licence condition and the criteria for reportable incidents.

(84) The Technical Manager shall complete an Incident Report in the VU Incident Management System.

(85) Note: Based on the low quantity and level of radioactivity of radiation sources at VU an emergency situation is deemed unlikely to occur e.g. a significant radioactive emission.

(86) However in the event of an emergency situation occurring in a radiation location at VU (e.g. fire) then the appropriate VU emergency management procedures shall be followed by all VU staff and or/students and visitors. Note: further information on Incident Management/Emergency Procedures is documented in the relevant 'Radiation Facility Manual'.

Disposal of Radioactive Material and Sources

(87) Waste disposal for radioactive sources at VU shall be determined by:

a. completion of a risk assessment; and,

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b. type and characteristic of the radioactive source to be disposed of.

(88) The three main disposal methods of radioactive waste at VU are:

a. dilution and dispersion;
b. delay and decay; and
c. containment.

(89) Short-lived radioactive material can be stored and allowed to decay and disposed of as non-radioactive waste. Radioactive wastes can also be diluted until deemed to be non-radioactive. Non-radioactive waste can then be disposed of through appropriate waste streams.

(90) Consideration of waste disposal at VU must also consider co-existing hazards such biohazard, chemical or GMO waste. Note: For further information on waste disposal guidelines refer to the relevant 'Radiation Safety Lab Manual'.

(91) There are special considerations for the disposal of X-ray radiation apparatus. The RSO must be notified prior to any disposal of such apparatus.

Transport of Radiation Sources

(92) Any transport of radioactive material (inclusive of between VU campuses or other Universities) must be approved by the RSO.

(93) Any transportation of radioactive material to and from VU must meet legislative requirements specifically in relation:

a. packaging;
b. labelling;
c. placarding; and
d. transportation must be consigned to a carrier licensed with the DH to do so.

Note: There are strict requirements in place under existing legislation for the transport of radioactive materials. VU does not hold a licence for vehicle transport of radioactive material (including sealed sources) on public roads.

Radiation Work involving Animals

(94) Any person using radioisotopes involving animal experiments at VU must abide by the requirements within this Procedure.

(95) This includes the completion of a risk assessment and SOP prior to the commencement of work.

(96) If the work is being planned for outside the radiation laboratory then the RSO and Technical Manager must be contacted to assess the suitability of the location and the potential hazard exposure of the radioactive source used.

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