UNIVERSITY OF BATH HEALTH AND SAFETY STANDARD

Ionising Radiation Safety Standard

Version Number	Version 4	Date of Approval	March 2024	Review Date	Three years from acceptance by UHSC
Author and Lead	Debbie Robarts; Scientific Safety Advisor				
Aims	The University is committed to ensuring the health, safety and welfare of all staff, students and visitors. The University will aim to achieve this by ensuring that the exposure of employees to ionising radiation arising from work activities is kept as low as reasonably practicable and does not exceed dose limits specified for individuals.				
Scope	This standard applies to university activities that use or produce ionising radiation (as defined below). This includes sealed and non-sealed sources, naturally occurring radioactive material (NORM), gamma rays and x-rays (including those used for medical uses such as the Dental Service). It does not include sources of non-ionising radiation such as Lasers, UV and EMF as these are covered in other SHEW specific documentation.				
Relevant Legislation	• Health & Safety at Work etc. Act 1974 (HASWA) • The Management of Health & Safety at Work Regulations 1999 (MHSWR) • The Ionising Radiation Regulations (IRRs) 2017 • Environmental Permitting Regulations 2016 • Ionising Radiations (Medical Exposure) Regulations 2017 • Nuclear Safeguards (EU Exit) Regulations 2019 Work with Ionising Radiation Approved Code of Practice L121				
Definitions	Ionising Radiation The transfer of energy in the form of particles or electromagnetic waves of a wavelength of 100 nanometres or less or a frequency of 3 x 10^{15} hertz or more capable of producing ions directly or indirectly. Exposure to ionising radiation can cause damage to living tissue.				
	Sealed Source A source containing any radioactive substance whose structure is such as to prevent, under normal conditions of use, any dispersion of radioactive substances into the environment.				
	Un-sealed (open) Source A form of radioactive material which is not encapsulated or contained and therefore if uncontrolled could lead to contamination. At the University, unsealed sources are used for biological research in the form of a liquid.				
	Designated Area An area designated as either “controlled” or “supervised” where specific procedures are required to restrict exposure to ionising radiation dependent on the potential effective dose as determined by risk assessment.				
	Naturally Occurring Radioactive Material (NORM) Radioactive materials which occur naturally and where human activities increase the exposure of people to ionising radiation. Examples are the natural gas Radon, and long-lived elements such as uranium, thorium and samarium are used in research at the University.				
	Radiation Protection Advisor (RPA) An individual or body that advises on compliance with the IRRs.				
	Radiation Protection Supervisor (RPS) Person/s appointed for the purpose of securing compliance with the Ionising Radiations Regulations 2017 in respect of work carried out in an area which is subject to Local Rules. In particular supervising the safe working arrangements set out in the Local Rules.				

	Radiation Protection Officer (RPO) This is not a post required by the IRRs. The role of the RPO is to support the University's work with ionising radiation by ensuring arrangements are in place to manage radiation risks, so that work is carried out safely and in compliance with Regulations and that University employees and the public are protected from harmful effects.
Responsibility for implementation	Faculty Deans Heads of Departments Technical Managers Principal Investigators (PIs)/Supervisors/Managers
Training availability:	Accredited training course for RPS Induction and task specific training provided by Supervisors/RPS General overview training provided by RPO (on request)

	Standard to meet:	**Accountability**	**Reference documents and more information**
1.	Ensure a risk assessment is in place for work with ionising radiation prior to that work commencing.	Head of Department	Regulation 8 of IRRs
2.	Appoint a competent RPS for work being undertaken with ionising radiation within department of responsibility. Ensure appointed person receives appropriate training and appointment made in writing.	Head of Department	
3.	Notify SHEW of any of the following: Changes to existing processes, e.g., new work to be commenced, and/or ionising radiation work to be stopped. If an overexposure has occurred Loss or theft of radioactive material ONR Safeguards annual report made Head of SHEW will then notify the HSE where required.	Head of Department/ Technical Managers/ PIs/RPS	Notifications to HSE
4.	Notify EA if there has been a breach of any permit limit.	Head of SHEW	
5.	Consult the RPA on compliance with IRRs, in particular: Suitability of risk assessments and local rules; Designation of controlled and supervised areas; Dosimetry requirements; Quality assurance requirements for medical equipment.	SHEW	
6.	Persons intending to work with any form of ionising radiation must register with their department RPS and SHEW using the registration form.	Users	Obtain form from RPS or RPO
7.	Ensure an up-to-date risk assessment is in place covering scope of work and a dose assessment included where applicable. The risk assessment must justify the use of ionising radiation; above a safer alternative.	PIs/Supervisors/ Users	
8.	Ensure an individual risk assessment is carried out for: Pregnant and breastfeeding women (once declared in writing) Persons aged under 18 years Persons aged under 16 years of age cannot be allowed to work with ionising radiation.	PIs/Supervisors/ Users	
9.	Be aware of requirements of the IRRs and University procedures for management of ionising radiation to as low a level as reasonably practicable.	Supervisors/ Users/	
10.	Ensure local rules are in place for work being undertaken. Consult department RPS and University RPO to ensure they are	Supervisors/ Users/PIs	

	suitable. Ensure local rules are followed.	RPS	
11.	Follow procedures for accounting for un-sealed sources on University accounting system.	Supervisors/PIs Users	
12.	Ensure radioactive waste is disposed of via the correct route and that permit levels are not breached. Record waste disposals for unsealed sources on University accounting system.	Supervisors/PIs Users	
13.	Ensure equipment which produces ionising radiation is maintained and calibrated at required intervals in accordance with manufacturer's instructions. Keep records for 2 years from date carried out.	Supervisors/PIs Users/ RPS	
14.	Notify SHEW if it is suspected that an exposure may have occurred to an employee in excess of any the following limits: Whole body dose: Employee > 18 years old - 1mSv (annual limit 20mSv) Trainee <18 years old – 0.5mSv (annual limit 6mSv) Extremity/skin dose: Employee > 18 years old – 10mSv (annual limit 500mSv) Trainee <18 years old – 5mSv (annual limit 150mSv) For Pregnant/Breastfeeding women – any suspected exposure to be reported (<1mSv to foetus, any intake of radionuclides or bodily contamination).	Supervisors/PIs Users/ RPS	
15.	Ensure monitoring equipment is made available to departments and calibrated annually.	SHEW	
16.	Ensure dosimetry is provided (area and individual) where deemed necessary by risk assessment.	SHEW	
17.	Maintain all required records: Dosimetry records for 2 years from end of calendar year Calibration records for 2 years from date of calibration Monitoring records for 2 years from date carried out Incident records for 2 years from date of incident	SHEW/RPS	
18.	Not misuse or interfere with any radioactive substance or any equipment which generates ionising radiation or is provided for protection against exposure to such.	Employees	
19.	Provide annual submission to Office for Nuclear Regulation (ONR) UK Safeguards where relevant nuclear material is held and notify SHEW of completion.	Head of Department/ RPS	Consult SHEW for advice https://www.onr.org.uk/safeguards/index.htm

Risk Assessment Title: Work with Ionising Radiation (IR)	Date Reviewed: February 2024	Review Date: March 2027
Overview/Description of Activity: Work with any form of ionising radiation including sealed and unsealed sources, x-rays, gamma rays and naturally occurring radioactive material (norm).	**Duration/Frequency of Activity**: Projects can be of any duration or length. This applies to all tasks with ionising radiation.	
Location of Activity: University facilities	**Generic or Specific Assessment:** Generic	

#	Hazard(s) identified	Who might be affected and how	Existing controls & measures	Severity (a)	Likelihood (b)	Risk Rating (a x b)	Additional control/action required
1	All sources of ionising radiation (general principles)	All persons working with or requiring entry to designated areas in the course of their work. Pregnant women and young people are especially at risk, as are inexperienced workers (such as undergraduate students). External exposure – irradiation from sources outside the body. Internal exposure – from inhalation or ingestion of radioactive substances. Radiation burns from high doses over a short time. Cancers, possibly resulting from low-level exposures over any period of time.	• All work where IR is used must be approved by the RPO. • All departments where IR is used shall appoint an RPS. • All work with ionising radiation must be covered by a set of Local Rules. • Local Rules must be adhered to by workers and enforced by the RPS. • All workers intending to use IR must be registered with the RPO and inform their departmental Radiation Protection Supervisor (RPS) of such planned work. • All workers using IR must be adequately trained in the specific safety aspects of working with IR. • All workers using IR must be appropriately supervised depending on the risk associated with the work and their level of experience.	4	2	8	

#	Hazard(s) identified	Who might be affected and how	Existing controls & measures	Severity (a)	Likelihood (b)	Risk Rating (a x b)	Additional control/action required
2	Working with X-rays, up to 250keV and 2mAmp, for 2 hours outside shielded enclosure. For 10 minutes inside enclosure (controlled area) with beam shutter closed for essential maintenance and beam alignment.	Persons using the x-ray equipment. Persons entering area when x-ray equipment operating. External exposure – radiation burns during beam alignment inside enclosure, to fingers from main beam, or to whole body from scattered radiation.	• X-ray equipment is appropriately shielded and interlocked. • Equipment is operated, serviced and maintained in accordance with manufacturer's instructions. • Area and individual dosimetry is provided where necessary by risk assessment and doses monitored by RPO. Doses are well below investigation limits. • Routine monitoring for leakage carried out by RPS and records kept.	4	2	8	

#	Hazard(s) identified	Who might be affected and how	Existing controls & measures	Severity (a)	Likelihood (b)	Risk Rating (a x b)	Additional control/action required
3	Working with sealed (closed) radioactive sources, for 1 hour adjacent to shielded experimental rigs up to 2GBq. For 4 hours adjacent to small sources up to 10MBq.	Persons working with sources or in the vicinity of the sources such as students observing experiment. External exposure – radiation burns to fingers from manipulating sources	• Sources must be adequately shielded when in use and in storage. • Access to the source/s must be restricted (locked away) to necessary personnel only. • Sources are 'wipe-tested' for contamination annuallyby the RPO. • Remote handling devices (such as tweezers or tongs) should be used when handling to distance fingers from the source. • Time handling or in vicinity of source shall be minimised. • Appropriate PPE to be worn, e.g., gloves, lab coat	4	2	8	

#	Hazard(s) identified	Who might be affected and how	Existing controls & measures	Severity (a)	Likelihood (b)	Risk Rating (a x b)	Additional control/action required
4	Working with unsealed (open) radioactive substances: up to 37 MBq, for 15 minutes with higher-energy radioisotopes (e.g., P-32 or S-35), for 1 hour with lower-energy radioisotopes (such as H-3 and C-14).	Persons working with sources or adjacent to such work. Other staff (such as lab assistants and porters) dealing with washing glassware and disposing waste. External exposure – irradiation from higher-energy sources (such as P-32 or S-35). Internal exposure – from inhalation or ingestion of radioactive substances.	• Ordering, use and disposal of all unsealed sources MUST be entered on the on-line management system (Radstock). This is because permit conditions stipulated by the Environment Agency, must be rigorously adhered to. • Amounts ordered and used in research are minimised to what is necessary. • Work must be conducted over containment trays. • Appropriate shielding must be used for higher-energy radioisotopes. • Work areas must be actively monitored before and during work and after work is complete. Any contamination found must be dealt with immediately. • Fingers monitors worn for high energy isotopes for extremity dose monitoring. • Dose monitoring shows doses are well below any investigation limits. • Wear PPE – safety spectacles will protect the eyes from some beta particles, and ordinary disposable gloves can protect from low-energy beta particles (e.g., from H-3 and C-14) and alpha particles and can be easily disposed of if contaminated.	4	2	8	

#	Hazard(s) identified	Who might be affected and how	Existing controls & measures	Severity (a)	Likelihood (b)	Risk Rating (a x b)	Additional control/action required
5	Working with naturally-occurring radioactive materials (NORM), containing uranium or thorium (alpha particle emitters). up to 250g of uranium or thorium salt, up to 1 kg of rock samples.	Persons working with NORM or adjacent to such work. External exposure from frequent and prolonged handling of the samples. Internal exposure – from inhalation or ingestion of radioactive dust emanating from the samples.	• Measure the dose from samples brought onto campus. If any dose exceeds 7.5 µSv/hr the RPO must be informed. • Materials should be stored in a well-ventilated area and care exercised when opening bags and containers so that any dust is not disturbed. • If sample preparation involves dust production, perform such work in a ducted fume cupboard or similar equipment providing local exhaust ventilation. • Consider using remote-handling tools if extended handling of samples is required. • Wear appropriate PPE (disposable gloves and safety glasses) when working with samples. Effective respiratory protection may need considering. • Ensure access is restricted to samples.	3	2	6	

#	Hazard(s) identified	Who might be affected and how	Existing controls & measures	Severity (a)	Likelihood (b)	Risk Rating (a x b)	Additional control/action required
6	Loss or theft of radioactive source Failure to provide information required by legal authority (e.g., annual returns)	Persons who may inadvertently come into contact with source Security concern requiring notification to authorities	• All sources kept in locked containers with key control • All sources in access controlled rooms/labs • Alarm on main store • Monthly accountancy checks which are recorded • Inventory systems in place which are checked regularly by RPO • Supervision of non-radiation workers	4	1	4	

Assessor signature	**Print name:** D Robarts (Scientific Safety Advisor and RPO)	**Date:**