

University Health and Safety Arrangements : Chapter 25



Ionising Radiation Safety

Key word(s): Ionising Radiation
 Ionising Radiation Regulations (IRR) 1999
 Environmental Permitting (England and Wales) Regulations 2011
 X-rays

Target audience: Heads of School, Principal Investigators, Radiation Protection Advisors,
 Radiation Protection Supervisors, Radiation Workers.

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Ionising Radiation Technical Advisory Group

1. Membership

Chair

Members:

Radiation Protection Supervisors

Trades Union Representatives of the University

In attendance:

Secretary

University Safety Co-ordinators

Representative of the Directorate of Estates

Radiation Protection Advisors/Radioactive Waste Advisors

2. Terms of Reference

The Technical Advisory Group will:

- a) Advise the Radiation Safety Co-ordinating Group (see Chapter 4) on matters relating to ionising radiation safety radiation safety associated with research and teaching.
- b) Submit to the Radiation Safety Co-ordinating Group for its approval, policies and action plans to ensure the University fulfils its obligations to staff, students and others with respect to all aspects of ionising radiation.
- c) Monitor compliance with legislative documents, radiation safety codes and area Local Rules, and to recommend to the Radiation Safety Co-ordinating Group any action necessary to improve compliance and/or performance.
- d) Promote co-operation and communication between the University, its staff and students in all matters relation to ionising radiation.
- e) Report to, and will be responsible for advising the Radiation Safety Co-ordinating Group on issues arising within University Schools* pertaining to the acquisition, use, storage and disposal of ionising radiation sources.

Introduction

3. The University of Manchester has responsibility for the development and administration of systems of control relating to radiological protection and must ensure compliance with all legislation governing work with sources of ionising radiation (including the Ionising Radiations Regulations 1999 [IRR99], The Environmental Permitting (England & Wales) (Amendment) Regulations 2011 [EPR2011], and the Health and Safety at Work Act 1974).

This document sets out the administrative and management Arrangements to ensure compliance with the Regulations.

Arrangements

4. The management of ionising radiation and radioactive sources at the University of Manchester will be carried out effectively and in full accordance with all legal requirements. In particular, sources of ionising radiation will only be used where there is

* including Research Institutes of the University

no safer alternative, and radiation exposures will be prevented as far as is reasonably practicable. Where there is a perceived risk of exposure, appropriate dosimetric monitoring will be carried out, and the results recorded and retained. The generation and disposal of radioactive waste material will be minimised and undertaken in accordance with the conditions of the University's EPR2011 Permits. The University will treat students and members of the public as employees in respect of its duty of care regarding radiological protection.

5. Good communication and co-operation will be established between managers and advisers, and managers will give each adviser power to inspect premises, view such records, and perform such tests as they may think appropriate.

Management of Ionising Radiation Safety

6. Radiation safety will be managed centrally on a day-to-day basis for the main University campuses situated north and south of the Mancunian Way; these areas will henceforth be referred to in this document as the North Campus and South Campus. For the Wolfson Molecular Imaging Centre, The Cancer Research UK Manchester Institute, and the Dalton Cumbrian Facility, day-to-day management will be undertaken locally. Each University site has been issued with separate EPR2011 Permits by the Environment Agency and will therefore maintain separate inventories of radioactive materials and records of radioactive waste disposals. Although some details of local management structure differ between the various sites (reflecting differences in the nature and scale of their radiological activities), the overall arrangements described in this document will apply to every such site.
7. **South Campus:** Day-to-day management of radiological safety on the South Campus will be carried out by the appointed Radiation Protection Officer (RPO) (Dr Stephen Bidey, 7th floor, Williamson Building, Oxford Road, Manchester M13 9PT), technical staff of the Radiation Safety Unit (RSU) and Radiation Protection Supervisors (RPSs) within individual University Schools. Local Management will be subject to advice from Public Health England as appointed RPA/RWA (see also sections 13 and 14).
8. **North Campus:** Day-to-day management of radiological safety on the North Campus (plus the Materials Sciences Centre) will be carried out by the appointed RPO (Dr John

Hughes) and RPSs within individual Schools. Local Management will be subject to advice from Public Health England as appointed RPA/RWA (see also sections 13 and 14).

9. The RPO for each of the above sites is ultimately responsible to the University Registrar, through the Head of Radiation Safety and the Radiation Safety Co-ordinating Group.
10. **Wolfson Molecular Imaging Centre:** Day-to-day management of radiological safety at the Wolfson Molecular Imaging Centre will be carried out by the site RPSs in association with Christie Medical Physics and Engineering as appointed RPA/RWA body (see also sections 13 and 14).
11. **Cancer Research UK Manchester Institute :** Day-to-day management of radiological safety at the Cancer Research UK Manchester Institute will be carried out by the site Radiation Protection Co-ordinator, in association with the appointed RPSs and with Christie Medical Physics and Engineering as appointed RPA/RWA body (see also sections 13 and 14).
12. **Dalton Cumbrian Facility:** Day-to-day management of radiological safety at the Dalton Cumbrian Facility will be carried out by the Radiation Protection Co-ordinator, and appointed RPSs. Local Management will be subject to advice from Public Health England as appointed RPA/RWA (see also sections 13 and 14).
13. **Radiation Protection Advisors:** As from January 1st 2014, the appointed RPA to the South Campus, North campus, and Dalton Cumbrian Facility is Public Health England. The appointed RPA for the Cancer Research UK Manchester Institute is Christie Medical Physics and Engineering,
14. **Radioactive Waste Advisors:** As from January 1st 2014, the appointed RWA to the North and South University campuses is Julian Dunderdale at Public Health England. The appointed RWA to the Dalton Cumbrian Facility is Peter Shaw of Public Health England. The appointed RWA for the Cancer Research UK Manchester Institute is Brian Murby (Christie Medical Physics and Engineering).

The University Radiation Safety Unit will:

15. For the South Campus, co-ordinate the acquisition of radioactive materials and the disposal of radioactive waste in accordance with the site EPR2011 Permit issued by the Environment Agency.
16. For both North and South Campuses, ensure that all records of radiation exposure of those University employees subjected to dosimetric monitoring are maintained and kept available for future consultation, whether or not such individuals are classified persons under IRR99, and that reports of anomalous exposure for any classified person or non-classified person are reported to and discussed by the Radiation Safety Technical Advisory Group.

17. For Schools on both North and South Campuses, undertake annual audits of written procedures, and inspections of laboratory facilities in which work involving ionising radiation is undertaken, providing written reports and advice to RPSs and Heads of Schools, and ensuring that the RPA is informed and consulted on the findings, when appropriate.
18. Liaise with the University's Approved Dosimetry Service (Christie Medical Physics and Engineering) and the RPSs within individual Schools.
19. In association with the appointed University RPOs, organise Radiation Safety Awareness Training for the University in its entirety.

Risk Assessments

20. Written Risk Assessments must be made of all techniques and procedures which have radiation safety implications for staff or students. Risk Assessments must be carried out in accordance with the specific requirements of IRR99, and associated Contingency Plans prepared, prior to the equipment being used or the technique being implemented. Risk Assessments must be carried out in consultation with the area RPS, who will consult the appropriate RPA if necessary. Particular attention must be paid to the risk to young persons (under 18 years old), women of child-bearing age, and nursing mothers. No children (under 16 years old) should be involved in any work involving ionising radiation.

Local Rules

21. All work with ionising radiation is legally required to be described within written **Local Rules**, the purpose of which is to set out the key arrangements for restricting radiation exposure in a particular School or an area therein. All radiation workers are required to gain familiarity with the Local Rules pertinent to their work areas. Any person who is an employee of another establishment who intends to work with ionising radiation on the premises of the University must also register with the Radiation Safety Unit prior to the commencement of such work. The School RPS will draw up Local Rules in consultation with the Head of School. If the Local Rules are modified in any way the relevant RPO must be informed and sent a copy of the updated Local Rules. The RPS must ensure that workers in his or her School or area have read, understood and followed the Local Rules and any subsequent modifications thereof.
22. Any individual working in several different areas of the University must, at any given time, conform to the Local Rules **relevant to the area in which their work is being undertaken**. If a person from another establishment undertakes work with ionising radiation on University premises, that individual must register with the Radiation Safety Unit prior to the commencement of such work and conform to the relevant Local Rules.

University personnel undertaking such work at another establishment will be required to abide by the Local Rules of the host establishment.

23. Regular reviews of radiation safety must be carried out within each University School, and may form part of a broad review of Health and Safety. A written report will be kept of all significant findings. In addition, for the North and South University campuses, the Radiation Safety Unit will conduct a formal laboratory survey and audit of each School on an annual basis and issue a report to the Head of School and its RPS(s).
24. A list of the names of all persons with special responsibilities for radiation protection within a School (e.g. RPA, RPS, Appointed Doctor in Occupational Health etc.) must be included in the Local Rules for each University School.
25. Local Rules for all Schools on the South Campus should specify that unsealed radioactive materials may only be procured through the Radiation Safety Unit. For all University sites, sealed sources may be procured directly from the appropriate supplier(s), but only after informing the site RPO to determine that such acquisitions can be accommodated within the terms of the relevant EPR2011 Permit.

Designated Areas

26. Laboratory areas in which radioactive materials are handled or stored, or in which machine sources of ionising radiation (e.g. X-rays) are generated, must be designated as "Controlled" or "Supervised", in accordance with the criteria laid down in IRR99 Section 16. All designated areas must be clearly delineated with appropriate warning signs and physical barriers. For any "Controlled area" required to be accessed by non-classified Radiation Workers, a relevant written **System of Work** must be prominently displayed, and each such area described in the Local Rules. The status of all Controlled and Supervised areas must be regularly reviewed to ensure that they are correctly designated and labelled. The RPS must consult the relevant RPO and, if necessary, RPA about any proposed changes in area designation.
27. If work with ionising radiation is discontinued in an area which was previously designated as a Controlled or Supervised area, or if a designated sink is no longer required for disposal of aqueous radioactive waste, a thorough check must be made by the RPS to ensure that no radioactivity remains as contamination. For all such areas on the North or South Campus, the Radiation Safety Unit **must** be informed to formally de-designate the area. For other University sites, the relevant RPO must be informed.
28. Should an item of equipment containing a radioactive source become redundant and targeted for disposal, the University RWA and the RPS for the School should be informed immediately. Assisted by the relevant RPO, he/she should prepare a Risk Assessment and appropriate Local Rules for the safe decommissioning of the equipment. In cases where decommissioning involves the University Estates team, the latter should have (i) been provided with copies of the above documents, and (ii) received suitable training,

prior to decommissioning commencing. The area RPS or RPO must be present during decommissioning whenever radioactive materials are relocated.

29. If a laboratory is being refurbished, or a new facility is being designed, the appropriate RPA **must** be informed, via the site RPO, and consulted at the planning stage in order to satisfy the legal requirements of IRR99 and EPR2011. Such consultation must be continued at regular intervals through until the point of commissioning of the laboratory or facility.

Dosimetric Monitoring

30. As an employer of Radiation Workers the University is required to designate as **Classified** any employee who is likely to receive a dose of ionising radiation which *exceeds three-tenths of any relevant dose limit*. No employee under the age of 18 may be designated as a Classified Radiation Worker. If an RPS wishes to designate a worker as "Classified", they must ensure that both the appropriate RPA and the Occupational Health Appointed Doctor are informed of the reason.
31. Any employee of the University who needs to be designated as a Classified Radiation Worker must, under the requirements of IRR99, undergo a prior medical examination, and be certified as fit, before commencing work, and annually thereafter. Medical surveillance will be provided by the Occupational Health Appointed Doctor, who will maintain a confidential health record for each Classified Radiation worker. This record will be kept for monitoring effects of radiation only. Any medical problems suspected to arise from the use of ionising radiations should be referred to the University Occupational Health Service. A further medical examination will be required on ceasing work with ionising radiations or on leaving the University.
32. When a Classified Worker changes employment the pre-employment medical examination need not be carried out if the person has been previously certified as fit within the previous 12 months and their relevant certification is made available for their new health record. The University is required to retain the health record of each Classified Worker for fifty years from the date of the last entry.
33. Employees who, as a result of their work activities, are unlikely to receive a dose of ionising radiation which exceeds three-tenths of any relevant dose limit, but may receive a dose exceeding one-tenth, will be registered with the University's approved Dosimetry Service as **Non-Classified** radiation workers, and issued with an appropriate dosimeter (e.g. whole-body TLD, or extremity TLD). Most radiation workers in the University, including all those under the age of 18, will fall within this category.
34. Dose limits for the abdomen of women of reproductive capacity are intended to protect the foetus, which is particularly sensitive to ionising radiations. Radiation workers who

become pregnant should inform their Head of School, in writing, as soon as possible so that appropriate advice may be given by the RPS and, if necessary, by the RPA. Where necessary, steps will be taken to ensure that working conditions allow compliance with the special dose limits applicable to the remaining duration of the pregnancy.

Contamination Monitoring of Designated Areas

35. All areas of the University where unsealed sources of radioactivity are stored or handled must be regularly and systematically monitored in accordance with the relevant area Local Rules. If surface contamination is detected, monitoring must be repeated after appropriate decontamination measures have been implemented. The RPS must agree appropriate monitoring arrangements with the site RPO. The results of such monitoring of working surfaces, floors and equipment must be recorded, even if no contamination is found. All monitoring equipment must be subjected to a functional test on an annual basis, and recalibrated following any required repairs. The records of all such monitoring and equipment calibration will be recorded and kept for at least two years.
36. In addition to routine monitoring, additional contamination monitoring must be undertaken if dispersal of radioactive material is suspected, and prior to maintenance work being carried out on fume cupboards, ventilation systems, drains etc.
37. Individual University Schools will be responsible for the provision of sufficient, suitable contamination and/or dose rate monitors (as appropriate), in order to ensure that such equipment is available at all times when work with ionising radiation is in progress. Advice on suitable instruments is available from the RPO, who must also be consulted before any new instruments are purchased.
38. External Radiation monitoring is required when there is a potential external radiation hazard from penetrating radiations (e.g. from gamma emitters, X-rays, or MBq quantities of beta emitters with a maximum energy > 0.3 MeV). Under IRR99, Regulation 16, Controlled or Supervised areas will need to be designated.

Responsibilities

39. The University of Manchester will take all reasonably practical steps to ensure the limitation of radiation dose to its employees. To this end, RPAs have been appointed from whom advice will be sought as necessary, as outlined in Schedule 5 of IRR99 and the Approved Code of Practice. In addition, the University will ensure the appointment of RPSs from within the line management structure of all Schools that use sources of ionising radiation, to provide an adequate level of day-to-day supervision of each School's work with such sources. RPAs, RWAs, site RPOs, and RPSs or their representatives will be invited to attend relevant Technical Advisory Group Meetings.

University Management

40. The senior management of the University:

- a) Will ensure, as far as reasonably practicable, the health and safety of its employees, of contractors working on the premises and of members of the public who may be exposed to the hazards arising from the use of ionising radiation. It will also take all reasonably practicable steps to protect the environment from discharges and disposal of radioactive waste.
- b) Will take all necessary steps to ensure compliance with EPR2011, IRR99, and any other relevant legislation.
- c) Is committed to a policy of restricting exposures to ionising radiation in accordance with the ALARP (As Low As Reasonably Practicable) principle and will affect this through the following organisational arrangements and responsibilities.
- d) Will liaise with any other employer whose employees are engaged in work on a University site. Likewise, if it is necessary for employees of the University to undertake work on a non-University site (e.g. an NHS Trust), a similar agreement will be made between the two employers with regard to radiation safety and supervision. In general, the Local Rules and Radiation Safety Policy pertaining to the "host" institution will apply, but all workers (i.e. of both employers) must be made aware of the procedures being undertaken by their colleagues, together with the associated hazards, irrespective of the employer.

Heads of Schools

41. Heads of Schools are responsible for ensuring that:

- a) The local arrangements for ionising radiation safety management are described in the School Safety policy.
- b) The local arrangement covers organisation and key contacts, role of Radiation Protection Supervisors and their duties, submission process for risk assessments, spillage and waste management, accident and incident reporting.
- c) A radiation protection programme is implemented and reviewed in their own School.
- d) Work with ionising radiation is adequately supervised and undertaken in accordance with written Local Rules. RPSs, appointed in writing by their Head of School, and approved by the site RPO, will ensure that such supervision is undertaken.
- e) The RPS is provided with a letter of appointment defining his/her roles and duties, with a copy being sent to the site RPO and to the secretary of the Radiation Safety Co-ordinating Group.
- f) All ionising radiation workers are registered with the University Radiation Safety Unit.

- g) All registered radiation workers are adequately instructed and trained to carry out their work with ionising radiation.
- h) An inventory of School radiation-monitoring equipment and radioactive materials is drawn up, maintained and reviewed.
- i) Procedures for the safeguarding of radioactive materials, and for the safe disposal of radioactive waste are drawn up, maintained and reviewed, such that all requirements of the EPR2011 are satisfied.
- j) No new or modified work activity involving ionising radiation commences unless a suitable and sufficient assessment of the risk to any employee or other person has been performed, and that any remedial actions required by this assessment have been carried out.
- k) Upon written notification, the conditions of a pregnant ionising radiation worker's exposure are such that the equivalent dose to the foetus is unlikely to exceed 1mSv during the remainder of the pregnancy. Also, the exposure of breastfeeding staff will be restricted to prevent significant contamination of the employee.
- l) Ancillary staff, such as cleaners, porters and maintenance staff, who are likely to work in the proximity of areas in which sources of ionising radiation are stored or handled, are instructed to recognise radiation warning signs and aware of any precaution that may be necessary.

Radiation Protection Advisors

42. As an employer of radiation workers, the University is required under IRR99 to appoint one or more **Radiation Protection Advisers (RPAs)** for the purpose of providing advice to senior management, pertaining to the Ionising Radiations Regulations 1999.
43. Specifically, under the provisions of IRR99, there are certain matters on which an RPA **must** be consulted:
- a) The implementation of controls required within Controlled and Supervised areas
 - b) The prior examination of plans for installations and the acceptance into service of new or modified sources of ionising radiation in relation to engineering controls, design features, safety features and warning devices provided to restrict exposure to ionising radiation,
 - c) The examination and testing of engineering controls, design features, safety features and warning devices, and
 - d) The regular checking of systems of work to restrict exposure to ionising radiation.
44. At the present time the appointed RPAs are (i) for the North and South Campuses, and the Dalton Cumbrian Facility, Public Health England, and (ii) for the Wolfson Molecular Imaging Centre and the Cancer Research UK Manchester Institute, RPA cover is provided

Christie Medical Physics and Engineering. The RPAs will be responsible to the University Registrar, through the Radiation Safety Co-ordinating Group.

Radioactive Waste Advisors

45. The disposal of radioactive waste from University sites is regulated by the Environment Agency under the terms of the site Permit issued under EPR2011. Holders of such Permits must appoint, as a 'qualified expert' a Radioactive Waste Advisor (RWA) who will advise the University senior management on the discharge of the following duties:

- Achieving and maintaining an optimal level of protection of the environment and the population from those activities undertaken by the University involving radioactive materials;
- Checking the effectiveness of technical devices for protecting the environment and the population from the consequences of such activities;
- Acceptance into service, from the point of view of surveillance of radiation protection, of equipment and procedures for measuring and assessing, as appropriate, exposure and radioactive contamination of the environment and the population; and
- Regular calibration of measuring instruments and regular checking that they are serviceable and correctly used.

46. The current RWAs for the University are Dr Stephen Bidey, (7th floor, Williamson Building, Oxford Road, Manchester M13 9PT), Julian Dunderdale and Peter Shaw at Public Health England, and Brian Murby at Christie Medical Physics and Engineering. The RWAs will be responsible to the University Registrar, through the Radiation Safety Co-ordinating Group.

Radiation Protection Officers

47. The duties of a site Radiation Protection Officer (RPO) include:

- a) Assisting the appointed RPAs and RWAs in meeting their statutory duties under IRR99 and EPR2011.
- b) Supervising the collection, storage and disposal of radioactive waste, in accordance with the University's site Permits with the Environment Agency.
- c) Maintaining an up-to-date record of all radioactive substances held on the relevant site.

- d) Maintaining regular liaison with the RPA and assisting him with such duties as contamination monitoring and the training of isotope users.
- e) Liaising with the RPSs on the relevant University site and with the University Radiation Safety Unit.
- f) Reporting the dosimetric monitoring results of any Classified Radiation Workers to the Radiation Safety Technical Advisory Group.
- g) Submitting to the Environment Agency the annual Pollution Inventory report on radioactive waste disposal from the relevant University campus.
- h) Reporting annually to the Environment Agency on any holdings of Category 5 sealed radioactive sources, in accordance with the site Standard Rules Permit to hold such sources.

Radiation Protection Supervisors

48. Each Head of School will appoint, in writing, one or more **Radiation Protection Supervisors (RPSs)** in accordance with the requirements of IRR99 and subject to the approval of the University RPO. It is a fundamental requirement that any person appointed as RPS must:
- a) Understand the requirements of the relevant legislation and of local rules in so far as they affect the work of the School;
 - b) Have the personal authority and be given the time and facilities to exercise the necessary supervision; and
 - c) Understand the precautions needed to restrict exposures.
49. Any individual being considered for the post of RPS will be encouraged to discuss the required duties with the site RPO prior to any decision being made to accept the appointment.
50. A Radiation Protection Supervisor (RPS) will:
- a) Provide direct supervision, enabling the University to comply with the requirements of the relevant legislation where sources of ionising radiation are in use.
 - b) Be directly involved with the School's work with ionising radiation, preferably in a line management position that will allow the exercise of close supervision to ensure that all work is done in accordance with the Local Rules
 - c) Recognise that responsibility of compliance with the Regulations lies with the Head of School; this responsibility cannot be delegated to the RPS

51. The core duties of an RPS include:-

- a) Monitoring to ensure that all radiological work within his/her area of responsibility is taking place within agreed Local Rules, current legislation and accepted good practice.
- b) Maintaining and monitoring the inventory of sealed sources of ionising radiation within his/her area; checking that they are securely maintained, recorded at their specified locations, under appropriate management control; and ultimately disposed of by an authorised route.
- c) Ensuring that in the event that an ionising radiation source is transferred either (a) to another University School, or (b) to an authorised Contractor (i.e. for final disposal), that such a source is handed over securely to the relevant RPS, RPO, or Authorised Contractor, and that a record of transfer is signed by both parties.
- d) Monitoring the list of Classified and Non-classified radiation workers within his/her area. The relevant RPO must be informed of any changes.
- e) Providing non-specialist advice to staff, students and management in regard to radiation protection matters.
- f) Referring promptly to the Head of School any radiation protection problem that cannot be resolved locally on a time scale commensurate with the risk.
- g) Liaising with fellow RPSs, the RPO, University Safety Co-ordinators and other central advisers in Health and Safety matters.
- h) Attending meetings of the relevant committees when required and in particular the relevant School Safety Committee and the Radiation Safety Technical Advisory Group.
- i) Ensuring that incidents and accidents involving ionising radiation are reported and investigated.
- j) Disseminating radiation protection information and reports to appropriate staff and students.
- k) Ensuring that new members of the School receive adequate information, instruction and training with respect to radiation protection matters.
- l) Identifying staff or students in his/her area who would benefit from appropriate radiation safety training or occupational health surveillance.
- m) Co-ordinating the implementation of advice from the RPO and RPA.
- n) Periodically (and not less frequently than annually) reviewing radiation protection procedures within his/her area.

52. In larger University Schools, it may be appropriate or necessary to appoint several RPSs, each with a responsibility for a particular area: this will generally be the case where a School undertakes radiological work in both campuses. As a guideline, current HSE recommendations are for the allocation of one RPS to every 10 – 15 radiation workers. While it is recognised that the RPS may not be the immediate line manager or supervisor

overseeing the work with ionising radiation, the RPS must nevertheless ensure that adequate supervision is maintained through meeting regularly with the relevant staff and students. The letter of appointment will inform the RPS of the expected duties and the specified areas of the School to which these duties relate.

53. The Head of School may also assign such other radiation protection duties to an RPS as appropriate.

54. To maintain continuity and competence of RPS cover within a School, any newly-appointed RPS must (i) have attended a Radiation Safety Awareness course, and (ii) wherever practicable, must be appointed at least 3 months prior to an existing RPS relinquishing the post, in order to gain full familiarity with, and working knowledge of, the procedures and techniques appropriate to the activities with ionising radiation sources in the School.

55. Should it not be possible to meet condition (ii) above, the intending RPS should, with the support of his/her Head of School, (a) liaise with an RPS in another University School, where similar procedures with ionising radiation are being undertaken, and (b) discuss with the site RPO whether attendance at a commercially-provided RPS training course (e.g. by Public Health England) might be appropriate.

Principal Investigators

56. In accordance with the general policy for Management of Health and Safety within the University, Principal Investigators (PIs) (including independent Research Fellows) have a duty, delegated to them from the Head of School, to provide "such supervision as is necessary" to ensure the safety of all persons for whom they are responsible. This includes all postdoctoral, postgraduate and undergraduate students working with sources of ionising radiation. PIs shall seek advice from their RPS in the first instance regarding any work which they intend to carry out with ionising radiation, and will inform him/her **in advance** of any intention to bring radioactive sources onto campus. Upon termination of a project, the PI must ensure that all radioactive materials are disposed of by means authorised in the site Permit.

Individual Radiation Workers

57. All individuals working with sources of ionising radiation must adhere to the procedures and conditions contained within the School's Local Rules. Prior to commencing work with ionising radiation, each worker is required to sign a declaration confirming that he or she has received a copy of the Local Rules, has read and understood the sections relevant to them, and agrees to act in accordance with them.

58. No individual may work with sources of ionising radiation in an unsupervised capacity until the RPS has provided a formal statement to the RPO (e.g. through completion and submission of the University's RW1 form or equivalent) that they are deemed to be competent and have received sufficient instruction and training within the School to enable them to work safely with those radioactive sources and techniques necessary for their project(s).
59. Demonstration of competency will typically involve attendance at an assessed Radiation Safety Awareness course, followed by a period of instruction and training in specific procedures within the worker's own School (see also under "Training Requirements").
60. All individuals working with sources of ionising radiation must be familiar with the properties of the ionising radiations that they propose to use, and have a legal duty to protect both themselves and others from any potential hazards associated with their work.
61. All individuals working with sources of ionising radiation must use 'reasonable care' to ensure their own and their colleagues' safety, and they must cooperate with all instructions from their RPS regarding the use of Personal Protective Equipment, dose measurements and assessments and, if relevant, medical surveillance.
62. All individuals working with sources of ionising radiation must not expose either themselves or others to ionising radiation to a greater extent than is reasonably necessary for the work.
63. In the event that a radiation worker intends to work with ionising radiation at another establishment, the relevant RPS and RPA must be informed of the details of such work prior to its commencement. The University RPS will then liaise appropriately with the his/her counterpart at the other establishment. All individuals working with sources of ionising radiation must inform the relevant RPA, through the RPS and site RPO, of any notifiable incidents, such as an apparent overexposure, spillage of material or loss of a source.
64. Any accident involving ionising radiation must be reported, without delay, to the relevant RPS, thence to the site RPO and the RPA.

Training Requirements

65. For all work involving ionising radiations, information, instruction and training, as specified in the IRR99, must be provided.
66. Any individual wishing to work with sources of ionising radiation must have received sufficient and appropriate information, instruction and training to enable them to work in

a safe and competent manner. The University will provide all employees and students who are engaged in work with ionising radiation with such information, instruction and training as is necessary to enable them to conduct their work in accordance with the requirements of IRR99 and EPR2011.

67. The provision of **Information** on radiation safety will be undertaken centrally, by the Head of Radiation Safety and technical staff from the University Radiation Safety Unit; one-day assessed courses on Radiation Safety Awareness are provided at intervals throughout each year.
68. **Instruction and Training** of radiation workers will be provided by individual Heads of School; the duty of delivery will usually be delegated to RPSs. Instruction is a principal function of the School's Local Rules, which all intending radiation workers must have read before commencing work. Training will involve demonstrating to intending radiation workers how to carry out the procedures described in the Local Rules, and will also be a responsibility of each School.
69. A written record of such formal training must be kept within the School, in respect of each individual, and the Radiation Safety Unit will maintain a central record of the training received by all individuals. The level of formal instruction and training required by an individual radiation worker will be dependent on the amount of relevant previous experience, and the nature of the work to be undertaken. School managers and area RPSs must monitor all work with radiation in their Schools to ensure that the training received by all individuals is reinforced by safe practice.
70. All staff and students working with sources of ionising radiation must attend a refresher course or update session on radiation safety at least every five years to ensure that they maintain and update their knowledge of relevant legislation, accepted 'best practice', and University procedures. Such sessions are typically organised within individual University Schools, under the direction of the RPS.
71. A Workshop for RPSs will be organised annually by the Head of Radiation Safety. The primary aim will be to advise RPSs of any recent or forthcoming changes in legislation which may affect the activities of their School, and to stimulate discussion and debate of matters affecting the management of radiation protection within the University. RPSs must attend this workshop at least once every three years, and any newly-appointed RPS must attend the first available workshop following their appointment.
72. Heads of Schools must ensure that ancillary staff, such as cleaners, porters and maintenance staff, who are likely to work in the proximity of areas in which sources of ionising radiation are stored or handled, will be instructed to recognise radiation warning signs and to be aware of any precautions that may be necessary. Most packages of radioactive substances delivered to the University which are likely to be encountered by ancillary staff are either "excepted" or "Type A" packages which contain a limited level of

activity and have been designed to ensure that a radiation hazard should not arise in the event of an accident situation.

Accounting for Radioactive Substances

73. Schools must compile records of the activities and locations of radioactive sources, both sealed and unsealed, and these should be kept for at least two years after the record was made. Accounting for sources must commence immediately after receipt of the source, and records should contain the following information:

- Means of identification
- Date of receipt
- Activity on date of receipt
- Location of source (updated regularly)
- Date and route of disposal/removal
- Activity on date of removal/disposal

Records of disposal should be kept for a minimum of 4 years.

74. Sealed radioactive sources must be uniquely identified, and the relevant details (source identification no., radionuclide, activity on receipt) must be recorded on both a local (i.e. School) and central register. Monthly checks should be made by the area RPS on the location of all sealed sources, records forwarded to the site RPO. The central register will demonstrate compliance with the site EPR2011 Permit.

75. Where sources are used in different laboratories within a School, they should be logged in and out of an appropriate locked store or safe. Whilst out of storage, the location of such sources should be monitored by the RPS on a more frequent basis (e.g. daily), and appropriate records kept.

76. The purpose of such records is to enable any losses to be identified quickly. Any 'missing' sources must be reported immediately to the RPO, so that relevant regulatory authorities may be informed.

77. An annual audit should be undertaken of all sealed sources to ensure that accounting record is a true record. This will be undertaken by the site RPO.

Procedure for dealing with radioactive materials of known identity and activity

78. For the North and South campuses, the University Radiation Safety Unit, in conjunction with the appointed RPA/RWA, will arrange for the transfer of life-expired sealed radioactive sources to approved contractors, in accordance with the site Permit issued by the Environment Agency under EPR2011. In accepting any such item, the RSU must be

provided with all relevant documentation relating to the source. On receipt, the item will be placed in secure storage, with appropriate shielding and relevant documentation, pending transfer to an approved contractor or disposal in accordance with the University's EPR2011 Permit. If disposal under a relevant EPR2011 exemption order is permissible, this may also be undertaken. All information relevant to the item, its date of receipt, storage and disposal will be entered into a written Inventory logbook.

Procedure for dealing with radioactive materials of unknown provenance

79. On occasions, The Radiation Safety Unit may be required to deal with radioactive materials or artefacts of unknown origin and/or activity. In accepting such items, the Radiation Safety Unit will endeavour to ascertain as much information as possible relating to each item, including written and verbal history, together with details of the owner and previous location on campus. On acceptance of such an item, the Radiation Safety Unit will use appropriate monitoring apparatus to determine the nature of any radiological hazard, together with the activity and associated radiation dose rate. All such items will be regarded as inherently hazardous until proven otherwise. Once a formal characterisation of the item has been completed, it will be placed in storage within the Radiation Safety Unit, with appropriate shielding, pending transfer to an approved contractor or disposal in accordance with the University's EPR2011 Permit. All information relevant to the item, its date of receipt, characterisation, storage and disposal will be entered into a written Inventory logbook. In certain cases, prior to accepting such materials for storage, it may be necessary for the Radiation Safety Unit to notify the Environment Agency of the nature and activity, in order to ensure compliance with the conditions of the University's EPR2011 Permits.

Sealed sources in the vicinity of maintenance or building operations

80. In circumstances where planned maintenance or building operations are necessary in the vicinity of equipment housing a sealed radioactive source, the equipment should, wherever possible, be temporarily decommissioned and the source removed by the RPS for secure storage in a locked, shielded facility. Where this is not possible, all work operations in the vicinity of the equipment should be subject to a prior Risk Assessment by the area RPS, in association with the relevant Project Manager or a representative of the University Estates team, to determine the likely risk of damage to the source or equipment housing it, e.g. through physical vibration. Particular attention should be focused on the likelihood of disturbance of any integral shielding material(s) that could give rise to a radiation dose in the vicinity of the equipment.

Definition of Terms Used:

- *Radiation* : throughout this document the term *radiation* shall only cover ionising radiation, i.e. alpha particles, beta particles, gamma rays, X-rays, and other forms of radiation which are capable of producing ions either directly or indirectly.

- *Radiation Protection Adviser (RPA)* : a person or corporate body appointed to provide expert advice on the use of ionising radiation (Regulation 13, IRR99).
- *Radioactive Waste Adviser (RWA)* : a person appointed to provide expert advice on the transfer and disposal of radioactive waste material, in fulfilment of the requirements of Article 38 of the European Basic Safety Standards Directive (96/29/EURATOM).
- *Radiation Protection Supervisor (RPS)* : an employee appointed under Regulation 17 (IRR99) to provide supervision to ensure that all work is carried out in line with the requirements of IRR99.
- *Local Rules* : Written rules pertaining to the safe use of ionising radiation, as required by legislation (Regulation 17, IRR99).

Bibliography

The Environmental Permitting (England and Wales) Amendment Regulations 2011, London, The Stationery Office.

The Ionising Radiations Regulations 1999, London, The Stationery Office.

Approved Code of Practice (ACOP) and guidance in support of IRR99. ISBN 0 7176 1746 7 reference L121

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