Guidance
Use of Ionising Radiation
GUIDANCE/19/UIR/13

INTRODUCTION

This guidance should be read in conjunction with the current University's Health and Safety Policy on RADIATION SAFETY - Ionising and Non-ionising.

The purpose of this Code of Practice is to ensure that exposure to ionising radiation is kept as low as reasonably practicable, any releases to the environment are within statutory limits and that individuals, whose work involves ionising radiation, are aware of the local arrangements and requirements. Compliance with policy and the guidance provided should ensure compliance with the relevant statutory requirements.

Further information and advice may be obtained from the Health and Safety Unit.

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GUIDANCE/19/UIR/13
Revised October 2013
1. Scope of the Policy

This Code of Practice will assist Colleges/Budget Centres and individuals, whose work involves sources of ionising radiation, in compliance with the following legislation:

- The Ionising Radiations Regulations 1999
- The Environmental Permitting Regulations 2010, as amended
- Commission Regulation (Euratom) 302/2005 concerning the application of the provisions on Euratom Safeguards
- The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (CDG 2009)
- The Medicines (Administration of Radioactive Substances) Regulations 1978
- The Medicines (Radioactive Substances) Order 1978
- The Ionising Radiations (Medical Exposure) Regulations 2000

The Ionising Radiation Regulations 1999 were made under the Health and Safety at Work etc. Act 1974 and are enforced by the Health and Safety Executive. These are primarily concerned with the protection of employees and other persons present on the employer's premises against the effects of ionising radiation arising from work activities.

The Environmental Permitting Regulations 2010, as amended, are enforced by the Environment Agency. These are primarily concerned with the protection of the environment by controlling the holding of radioactive materials and the accumulation and disposal of radioactive waste. This control is exercised by imposing limits on the amounts of radioactive material that may be present on premises and disposed of from them by various specified methods and subject to certain conditions within issued EA Permits. EA Permits have been issued to the University covering sealed/closed and unsealed/open sources.

The Euratom Safeguards Regulations concern the acquisition, control and disposal of materials containing uranium, thorium and plutonium, and is enforced by the Directorate of Euratom Safeguards of the Commission of the European Communities operating via the Department of Trade and Industry.

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (CDG 2009) is enforced by the Office for Nuclear Regulation (ONR). It governs the packaging, labelling and movement of radioactive substances.

The other pieces of legislation referred to above relate to the use of sources of ionising radiation in medicine and impose certain requirements on those responsible for such work. Although each item of legislation is concerned with a particular aspect of control where ionising radiation is concerned, there are many common requirements and the Code of Practice that follows is intended to cover the legislative requirements.

The current Radiation Policy and this Code of Practice shall apply to all radioactive substances, accelerators emitting ionising radiation with an energy higher than 1 MeV and also to radiation generators (e.g., x-ray sets) in which charged particles are accelerated through a potential difference of at least 5 kV volts.

2. Exceptions to the Code of Practice

Work with ionising radiation shall not be required to be notified in accordance with regulation 6, IRR 99 to the operation of any:

- cathode ray tube intended for the display of visual images; or
- any other electrical apparatus operating at a potential difference not exceeding 30 kV,
provided that the operation of the tube or apparatus does not under normal operating conditions cause a dose rate of more than $1\mu$Sv$\cdot$h$^{-1}$ at a distance of 0.1m from any accessible surface.

3. Central Advice, Administration and Control

The University has appointed a Radiation Protection Adviser (RPA), within the Health and Safety Unit, to give advice on all aspects of the use of ionising radiation in accordance with the Ionising Radiations Regulations 1999. In addition to giving such advice, the Health and Safety Unit has responsibility for keeping various records on behalf of the University in accordance with the requirements of relevant legislation and for making applications and submitting notifications to the enforcing authorities on behalf of the University.
4. Local Arrangements in Colleges/Schools

The Head of College/Budget Centre, in which ionising radiation is used, has responsibility for ensuring the Implementation and enforcement of University Policy within their College/School. Arrangements need to be in place to ensure that work involving ionising radiation complies with the University's Radiation Policy and Code of Practice.

Where necessary, in consultation with the University’s Radiation Protection Adviser, the Budget Centre should make and set down in writing rules controlling the use of sources of ionising radiations. Areas will be designated as appropriate by the Radiation Protection Adviser. Where it is necessary to designate areas as “Controlled” or “Supervised” then these written rules are referred to as "local rules". These are to be brought to the attention of all persons who may be affected by them including visitors.

The Radiation Protection Adviser/Health and Safety Unit must be kept informed of all new and current work involving ionising radiations, any significant changes and of all proposals to extend such work.

No work is to be carried out without a prior risk assessment which will have outlined the necessary arrangements. Persons working with ionising radiation should have received adequate information, instruction and training and they should following the appropriate procedures. Where unsafe working conditions are identified, action must be taken.

Radioactive material (sealed and unsealed) must be securely stored when not in use. Stock, contamination monitoring and disposal records are to be maintained.

Where there has been an accident involving sources of ionising radiation or there is an indication to a loss of material or failure of any safety device, then these need to be reported as soon as possible to the Health and Safety Unit.

Where the School is large it is impractical for one person to supervise a large number of radiation workers in a number of areas, in this case there should be a main contact nominated to co-ordinate the arrangements in place, i.e. a Radiation Protection Co-ordinator.

University Policy clearly outlines the responsibilities that supervisors have for those working for them. It is therefore appropriate that where a supervisor is responsible for the supervision of a research team, or anyone who uses ionising radiation in a “Controlled” or “Supervised” area, that person should act as the Radiation Protection Supervisor or appoint someone of sufficient authority to act as the Radiation Protection Supervisor. A requirement of the Ionising Radiation Regulations is that appointment of Radiation Protection Supervisors must be in consultation with the University Radiation Protection Adviser. The names of the appointed Radiation Protection Supervisor must be included in the “local rules” covering the area they supervise.

Radiation Protection Co-ordinator, acting on behalf of the Head of Budget Centre, should where necessary:

- co-ordinate the implementation of Policy, Code of Practice, guidance and advice from the University’s Radiation Protection Adviser;
- periodically review radiation protection procedures within their College/School;
- where new work is proposed or there are significant changes, facilitate consultation with the University’s Radiation Protection Adviser; and
- facilitate the collection and return of local records, such as disposal records, as required by the Health and Safety Unit in a timely manner.

It will be necessary to ensure that there are arrangements for:

- discussing and reviewing radiation protection matters regularly at a local radiation protection committee or part of the local health and safety committee;
- the timely distribution and return of thermo luminescent dosemeters (tlds) and/or extremity tlds where issued;
- maintenance of a system for records of stock sources, contamination surveys and disposal records; and
- assisting in ensuring that equipment and processes are maintained as required by legislation.
They should ensure that persons using ionising radiation:

- are aware that the University’s Radiation Protection Adviser is to be consulted and that adequate precautions are taken regarding any new radiation hazard or any changes to an existing procedure;
- staff and students are suitably informed, instructed and trained;
- adequate records are maintained;
- safe working practices and prior Risk Assessments are drawn up and complied with; and
- systems are set up and maintained to check those radiation protection facilities such as monitors, personal monitoring devices, shielding, etc. are provided and maintained in good condition.

In matters of urgency, they should refer any significant matters that cannot be resolved locally to the Head of College/Budget Centre and the University’s Radiation Protection Adviser (RPA).

Note: In some cases, the Radiation Protection Co-ordinator may also have a role as a Radiation Protection Supervisor.

**Radiation Protection Supervisors** play a fundamental role in ensuring compliance with the Ionising Radiation Regulations (IRR 99) through the “local rules”. As such, Radiation Protection Supervisors are required to monitor compliance with those arrangements set out in the “local rules” and should:

- oversee the work, from time to time, to ensure that persons are following the appropriate procedures set out in the “local rules”; and
- where unsafe working conditions, that may lead to radiation exposure, are identified that preventative action is recommended and pursued.

**Project or Work Supervisors** must:

- ensure that work has been properly assessed before commencement;
- persons, under their supervision, have received adequate information, instruction and training;
- ensure that appropriate control measures are used and procedures followed and that persons are aware of the risks and procedures in the event of accidents or incidents;
- provide appropriate supervision and monitor compliance with policy and local working rules; and
- ensure that persons keep appropriate records.

**Individuals, including contractors and visitors** must:

- co-operate with any person appointed to advise or monitor health and safety in the local safety arrangements for radiation safety;
- adopt safe practices in activities involving sources of ionising radiation, in particular to carry out the work in designated areas, to wear appropriate dosimetry, personal protective equipment and clothing where required;
- where required to keep appropriate records; and
- report any radiation incidents, accidents or defects in equipment relating to the handling or use of sources of ionising to the local health and safety co-ordinator as soon as practicable.

### 5. Planning Work involving Sources of Radiation – Risk Assessments

In consultation with the University’s Radiation Protection Adviser, before any work is undertaken that involves the use of any type of ionising radiation source, an assessment of the hazards must be made, having regard to potential exposure to external and internal radiation hazards from normal operations and foreseeable accidents as appropriate. Procedures must be devised and protective measures introduced to ensure that exposure to ionising radiation is minimised, and under no circumstances must work be undertaken that could lead to the dose limits in Appendix 1 being exceeded. The assessment should be made and available to all persons subject to it.

Responsibility for making assessments rests with the Project Supervisor who must seek advice and assistance from the College or School Radiation Protection Co-ordinator and if necessary from the University’s Radiation Protection Adviser. Examples of potential hazards and model control measures are given in Guidance and available from the Health and Safety Unit.
6. Notification of the Acquisition of Sources

The Health and Safety Unit must be informed before any source of ionising radiation is brought onto University premises or before any significant change is proposed to existing equipment or work involving ionising radiation. This applies to radioactive materials (which are not received in the standard way via the Health and Safety Unit) and radiation generators acquired from any place and by any method including purchases, loans and gifts.

Only certain quantities of radioactivity are permitted on University premises at any time subject to specified conditions. The need for any new sealed source should be justified prior to acquisition. In addition, where there are plans to acquire sealed sources or order significant quantities then the Health and Safety Unit should be contacted as any change to an existing EPR Permit can take up to 3 months to be processed by the Environment Agency. Any change to an existing Permit may require a variation/application fee to be presented with the application form to the Environment Agency.

Where a College or School is considering the acquisition of any radiation sources, they should take into account the future disposal cost and liabilities as part of their costing. In some cases, suppliers may agree to take back sources on an exchange basis.

7. Records of Radioactive Material

College/Schools must compile records of the activities and locations of radioactive sources, sealed and unsealed, and these should be kept for at least two years after the disposal of the sources. The purpose of such records is to enable any losses to be identified quickly.

For sealed sources, the record should include:
- unique identifier;
- radionuclide;
- source activity/reference date
- date of acquisition; and
- supplier
- location
- source owner

This information is to be copied to the Health and Safety Unit on receipt.

Sealed sources are to be tightly controlled and securely stored when not in use, periodic verification of sealed sources is required to be checked against their records at appropriate intervals that must not exceed a year.

For unsealed sources, there is a standard stock record form available from the Health and Safety Unit. A new stock record form must be initiated on receipt of the material irrespective of whether it is going to be used immediately or at some time in the future. Stocks and records should be checked periodically.

If sources are moved or transferred to other locations, i.e. another School or Department, a standard record form is available from the Health and Safety Unit. Retain the original and send a copy to the University’s Radiation Protection Adviser, Health & Safety Unit

Colleges/Schools are required to notify the Health and Safety Unit immediately if they suspect any sources have been damaged, misplaced, lost or stolen.

8. Records of Radiation Generators

Colleges/Schools must keep records of all radiation generators to which these rules apply and copies must be sent to the Health and Safety Unit on request. The Health and Safety Unit must be advised of any plans to acquire any new radiation generators or dispose of any. The University’s Radiation Protection Adviser needs to be consulted.

9. Keeping of Radioactive Material

Radioactive material, sealed and unsealed, must at all times be kept in suitable containers and suitably stored except when actually in use or while being moved, transported or disposed of. Containers should prevent dispersal of the radioactive material; shielding may be required.

There are standard conditions set out in the EA EPR Permits and the current Permit should be referred to. Where material is stored then this should be appropriately labelled and secured. Other
factors such as resistance to fire, ventilation, shielding, flooding and weather protection should be considered where necessary. Advice on suitable containers and storage can be obtained from the Health and Safety Unit.

10. Disposal of Radioactive Material

The University is permitted to dispose of such waste only by specified methods, within specified limits and subject to specified conditions. The separate guidance document, with a summary of the current methods and limits that are applicable at the University and of the procedures to be followed in each case, is to be used. This information is available from the Health and Safety Unit.

The disposal of radioactive material by transfer to other premises away from the place at which they are normally kept must be notified to the Health and Safety Unit in advance. Disposal of radioactive waste in any form is subject to control by the Environmental Permitting Regulations 2010, as amended.

11. Transport and Movement of Radioactive Material

(a) Transport

Whenever radioactive material, sealed or unsealed, is to be transported (i.e. by road, rail or air) it must be packaged, labelled and carry documentation in accordance with the requirements of relevant regulations. Packages received from recognised commercial suppliers can be expected to be properly packaged, labelled and documented; this being the consignor’s responsibility.

If a University College/School is the consignor, then responsibility rests with the individual concerned who must seek the advice and assistance of the Health and Safety Unit.

Vehicles used to transport radioactive material (i.e. on public roads), either to or from the University, or as part of a programme of work, are also subject to the requirements of regulations and the advice of the Health and Safety Unit must be sought. Those responsible for arranging the transport of radioactive material must ensure that the insurance policy for the vehicle allows its use for such a purpose.

(b) Movement

When radioactive material are moved from place to place within the University, they must be in containers which are appropriately packaged, labelled and suitable for the purpose, having particular regard to shielding, containment and the potential hazards likely to be encountered. This applies to movements within buildings as well as from building to building.

12. Temporary Removal of Radioactive Material from the University

Temporary removal of radioactive material from the University for use at other premises is controlled by the Environmental Permitting Regulations 2010, as amended. Only certain specified sealed sources may be so removed; unsealed sources may not be removed. It is often necessary to give at least 28-days notice to the appropriate authorities of the intention to move sources to use at another location. Any change to an EA EPR Permit can take up to about 3 months.

The Health and Safety Unit is responsible for ensuring that the University complies with the quantity conditions relating to the sources that may be removed temporarily, and no sources may be removed from the University without first obtaining permission.

13. Leak Testing of Radioactive Sources

Leak tests must be carried out on sealed source capsules or containers at intervals not exceeding 2 years. This requirement relates primarily to sealed sources, but should also include unsealed sources that are used infrequently. Certain sources of low activity or of small dimensions may be exempt from testing with the agreement of the Health and Safety Unit. The Health and Safety Unit on behalf of Colleges/Schools will perform leakage tests.

14. Designation of Areas in which Radioactive Sources are kept and used

Laboratories must meet a particular standard and guidance is available from the Health and Safety Unit. Where, for reasons of potential internal radiation hazards, controlled or supervised areas are to be established and both adequate and appropriate washing and changing facilities must be provided and maintained.
Examples of some of the criteria used to determine whether or not “Controlled” or “Supervised” areas need to be established are given in Appendix 3. The University’s Radiation Protection Adviser must always be consulted about this matter and will designate the area as appropriate.

“Controlled” and “Supervised” areas must be described in “local rules”. “Controlled Areas” must be physically demarcated or delineated by suitable means and access must be restricted in an effective way. Standard notices, available from the Health and Safety Unit must be used to identify controlled, supervised areas and low level areas.

(a) Controlled Areas

Colleges/Schools shall have areas where it is necessary for any person who enters or works to follow special procedures designed to restrict significant exposure in that area or in which doses of ionising radiation are likely to exceed 0.3 of any dose limit for employees aged 18 years or more, designated as a “Controlled area”.

No person may enter or remain in a “Controlled” Area unless they are either a “classified person”, or enters and remains in the area according to a written system of work such that employees aged 18 years or more do not receive annual doses from external or internal exposure exceeding 0.3 of any relevant dose limit, and other persons do not receive annual doses exceeding any relevant dose limit.

Advice on the choice between persons being “classified” or working to systems of work must be obtained from the University Radiation Protection Adviser, Health and Safety Unit.

(b) Supervised Areas

Colleges/Schools shall have areas, where it is necessary to keep the conditions of the area under review to determine whether the area should be designated as a “Controlled Area” or in which doses of ionising radiation are likely to exceed an effective dose of 1 mSv a year or and equivalent dose of one tenth of any dose limit for employees aged 18 years or more, designated as a “Supervised area”.

(c) Low Level Areas

Areas in which doses of ionising radiation are unlikely to exceed an effective dose of 1 mSv a year or and equivalent dose of one tenth of any dose limit shall be designated as "low level areas”.

15. Designation of Classified Persons

An employee who is likely to receive doses of ionising radiation exceeding 0.3 of any relevant dose limit shall be designated by the University Radiation Protection Adviser as a “classified person” and will be informed of this. Normally where “classified person” status needs to finish this will only cease at the end of a calendar year and any individuals affected must be kept informed. Where a “Classified Person” finishes employment then a termination record will be supplied to them.

Employees under the age of 18 years will not be designated as classified persons. Students are regarded as radiation workers (see Appendix 1), and trainees while undergoing instruction or training that involves exposure to ionising radiation are treated as employees.

Before any person may become a designated “classified person”, they must undergo medical examination by the University’s Appointed Radiation Doctor in the Occupational Health Unit. They will then be declared fit (condition or not) or not fit for radiation work. If classified, they will remain under medical surveillance until they are declassified. Arrangements for medical surveillance and record keeping, by the University’s Appointed Doctor, are made by the Occupational Health Unit.

16. Personal Dosimetry – Approved Dosimetry Service (ADS)

An employee who is a “classified person” must be subject to appropriate personal dosimetry in order that any significant doses of ionising radiation are assessed. The University Radiation Protection Adviser can advise on appropriate methods of dosimetry and assist in making arrangements with approved dosimetry services, including arrangements for the compilation of cumulative dose records and the provision of termination records. Where other dosimeters are used, that are provided by another dosimetry service, then arrangements need to be made to send copies of dose records to the Record Keeping Service, RRPPS. The Radiation Protection Adviser must be promptly informed when any person designated as a “Classified Person” leaves the University.

Each month, dose reports are copied to the Radiation Protection Adviser; where an effective dose of 0.5 mSv or more is reported the circumstances of the dose recorded will be investigated.
If personal dosemeters are lost, damaged or destroyed, or there is any reason to doubt the validity of a personal dose assessment, or if abnormally large or unexpected doses are recorded, an investigation must be made in collaboration with the Radiation Protection Adviser. In the event of an accident which might result in significant personal contamination or a significant dose being received, the Health and Safety Unit must be informed immediately so that appropriate action can be taken.

The Radiation Protection Adviser or Head of Budget Centre may require some persons who are not "classified persons" to be subject to personal dosimetry. Schools and Departments will make arrangements with the Approved Dosimetry Service for the provision of dosemeters. Records for all persons monitored are kept on behalf of the University's by the Record Keeping Service of the Approved Dosimetry Service. Dose reports are copied to the Radiation Protection Adviser; where an effective dose of 0.2 mSv appears on two consecutive reports or 0.3 mSv (or more) on one report the reason for the reported dose will be investigated.

Any persons who is being monitored (or has been in the past) can on request to the University's Radiation Protection Adviser, at reasonable notice, be provided with a copy of their dose record.

The principal Approved Dosimetry Service and Record Keeping Service used by the University is the RRPPS Approved Dosimetry Service, 63 Melchett Rd, Kings Norton, Birmingham B30 3HP.

17. Monitoring of levels of Radiation and Contamination

Every College and School, where applicable, must make and keep records of measurements of the levels of radiation and contamination in “Controlled” and “Supervised” areas and in adjacent areas. The frequency, nature and extent of such monitoring will depend on local circumstances but it must be such as to detect any significant changes quickly. In other areas where unsealed sources are used, periodic contamination surveys shall be made and recorded. The advice of the Health and Safety Unit should be sought on such monitoring.

Instruments used for monitoring must be properly maintained and be subject to examination and tests, as appropriate, each year by the Health and Safety Unit which will issue a record of the test. If any modification is made that may affect its response, the instrument needs to be examined.

Records of measurements must be kept for two years from the measurement or test dates. Suitable instruments for checking personal contamination must be available at all times when unsealed sources are used.

18. Notification of Certain Occurrences

If there are any grounds to believe any loss or theft of radioactive material, this must be reported immediately to the Health and Safety Unit. On investigation, if confirmed, the Environment Agency and Police will be notified forthwith. In addition, if the quantity exceeds specified amounts given in Column 5 Appendix 4, the Health and Safety Executive will also be notified forthwith.

All abnormal events/incidents must be reported using the University Accident/Incident report form. If there is a release to atmosphere or a spillage of a quantity of radioactive material in excess of specified amounts, examples of which are given in column 4 Appendix 4 (under IRR '99 Regulation 30) for radioisotopes in common use at the University, this must be reported immediately to the Health and Safety Unit who will make an investigation and if appropriate notify the Health and Safety Executive forthwith.

19. Arrangements for Dealing with Emergencies

Every College/School should keep readily available at all times equipment and materials for cleaning up small spillages of radioactive materials and for preventing access to the affected areas. Such equipment should include appropriate protective clothing.

Small spillages are those involving quantities less than those in Column 5, Appendix 4. If spillages in excess of those in Column 5 of Appendix 4 occur, the assistance of the Health and Safety Unit should be sought immediately. Any other incidents (e.g., fire, flooding, and loss of shielding) involving radioactive sources should be reported to the Health and Safety Unit as soon as possible.

20. Visiting Radiation Workers and Other Persons

If visiting radiation workers or other persons are to enter and remain in “Controlled” or “Supervised” areas, appropriate arrangements must be made to ensure that appropriate dose limits are not exceeded. Where and “outside worker” (i.e. designated “classified workers” employed by a different
radiation employer) works in “Controlled Area” belonging to another undertaking, they must be in possession of a radiation passbook. An “outside worker” should present their radiation passbook before being allowed to enter a “Controlled Area”. Dose records will be maintained in these radiation passbooks; radiation protection supervisors or their delegated representatives are authorised to make appropriate dose entries on behalf of the University. Liaison with any outside employers of the individuals concerned will be necessary; the University’s Radiation Protection Adviser must be consulted in such situations.

Similar arrangements must be made when University employees and students propose to visit other establishments and the Health and Safety Unit must be notified well in advance of such visits so that medical examinations and passbooks can be arranged if necessary.

21. Use of Ionising Radiation in Medical and Dental Diagnosis, Therapy and Research

Special conditions apply when ionising radiation is deliberately used on human beings in the medical and dental fields for the purposes of diagnosis, therapy and research.

Radioactive medicinal products may only be administered to human beings by a doctor or dentist who holds a certificate issued by the Minister of Health or by a person acting under the direction of such a doctor or dentist. Proposals for research uses of ionising radiation in this area must be submitted to the University’s Radiation Protection Adviser, Health and Safety Unit, for approval.

When ionising radiation is used for diagnostic or therapeutic purposes in the medical and dental fields, the person who directs the exposure must be adequately trained and aware of the requirements of the Ionising Radiation (Medical Exposures) Regulations 2000. Advice may be obtained from the University’s Radiation Protection Adviser, Health and Safety Unit.

22. Good Radiation Protection Practices to Minimise Exposure

Doses should be kept as low as reasonably practicable. Good radiation protection practices must be used at all times in order to comply with the requirements of these rules. Included in the list of such practices are:

- the use of shielding, distance protection;
- not directly handling sources, where applicable
- interlocks, where appropriate, the operation of which must be checked regularly;
- minimisation of exposure time;
- minimisation of source activity/strength;
- adoption and maintenance of safe systems of work;
- containment of radioactive substances;
- provision of suitable procedures/facilities to minimise contamination or its spread;
- regular contamination monitoring;
- provision of suitable protective clothing; and
- use and maintenance of warning signs, warning lights (i.e. for generators) and labels.

In particular:

- no sealed source may be held in or directly manipulated by the hand unless the dose rate to the skin of the hand does not exceed 75 µSv h⁻¹, when averaged over 1 minute;
- so far as is reasonably practicable, no unsealed radioactive substance is to be held in or directly manipulated by hand; and
- no employee shall eat, drink or apply cosmetics in areas where there is a risk of internal radiation hazards.

Relevant items of the type listed above should be included in local rules and systems of work.

23. Information, Instruction and Training

All employees, trainees and others who may be exposed to ionising radiation must be adequately informed and instructed about the hazards and necessary precautions before commencing work involving sources of ionising radiation.

Women who work with ionising radiation must be informed of the possible hazard to the foetus in the early stages of pregnancy, and should inform their School/Department or School as soon as they discover that they are pregnant. Advice is available from the Health and Safety Unit/Occupational Health Unit.
All "classified persons", radiation workers and trainees working with ionising radiation must be given appropriate training in radiation protection before commencing work involving sources of ionising radiation. Courses covering basic matters will be organised by the Health and Safety Unit, but these must be supplemented by local instruction in correct techniques and compliance with local rules/arrangements.

24. Misuse of or Interference with Sources of Ionising Radiation

No person shall intentionally or recklessly misuse or without reasonable excuse interfere with any radioactive substance or any radiation generator.

25. Personal Responsibility

A person engaged in work with ionising radiation shall:

- not knowingly expose themselves or others to ionising radiation to an extent greater than is reasonably necessary to carry out the work, and shall exercise reasonable care;
- make full and proper use of any personal protective equipment provided and of personal dosemeters; and
- promptly report any defects in personal protective equipment or damage to dosemeters to their Supervisor or Radiation Protection Supervisor.

26. Links to Web Pages


The Health and Safety Commission’s publication L121, *Work with Ionising Radiation* sets out the regulations, approved code of practice and guidance. [http://www.hse.gov.uk/pubns/books/l121.htm]

Ionising Radiations Regulations 1999 related guidance is available on the HSE's webpage [http://www.hse.gov.uk/radiation/ionising/index.htm]


Euratom Safeguards in the UK [http://www.hse.gov.uk/nuclear/safeguards/euratom.htm]


The Administration of Radioactive Substances Advisory Committee (ARSAC) [http://www.arsac.org.uk/]


APPENDIX 1

DOSE LIMITS

(Irr 99 Regulation 11 Schedule 4 - Part I)

Classes of Persons to whom Dose Limits Apply

Employees of 18 years of age or above

1. For the purposes of regulation 11(1), the limit on effective dose for any employee of 18 years of age or above shall be 20 mSv in any calendar year.

2. Without prejudice to paragraph 1:
   1. the limit on equivalent dose for the lens of the eye shall be 150 mSv in a calendar year;
   2. the limit on equivalent dose for the skin shall be 500 mSv in a calendar year as applied to the dose averaged over any area of 1 cm$^2$ regardless of the area exposed;
   3. the limit on equivalent dose for the hands, forearms, feet and ankles shall be 500 mSv in a calendar year.

Trainees aged under 18 years

3. For the purposes of regulation 11(1), the limit on effective dose for any trainee under 18 years of age shall be 6 mSv in any calendar year.

4. Without prejudice to paragraph 3:
   1. the limit on equivalent dose for the lens of the eye shall be 50 mSv in a calendar year;
   2. the limit on equivalent dose for the skin shall be 150 mSv in a calendar year as applied to the dose averaged over any area of 1 cm$^2$ regardless of the area exposed;
   3. the limit on equivalent dose for the hands, forearms, feet and ankles shall be 150 mSv in a calendar year.

Women of reproductive capacity

5. Without prejudice to paragraphs 1 and 3, the limit on equivalent dose for the abdomen of a woman of reproductive capacity who is at work, being the equivalent dose from external radiation resulting from exposure to ionising radiation averaged throughout the abdomen, shall be 13 mSv in any consecutive period of three months.

Other persons

6. Subject to paragraph 7, for the purposes of regulation 11(1) the limit on effective dose for any person other than an employee or trainee, including any person below the age of 16, shall be 1 mSv in any calendar year.

7. Paragraph 6 shall not apply in relation to any person (not being a comforter or carer) who may be exposed to ionising radiation resulting from the medical exposure of another and in such a case the limit on effective dose for any such person shall be 5 mSv in any period of 5 consecutive calendar years.

8. Without prejudice to paragraphs 6 and 7:
   4. the limit on equivalent dose for the lens of the eye shall be 15 mSv in any calendar year;
   5. the limit on equivalent dose for the skin shall be 50 mSv in any calendar year averaged over any 1 cm$^2$ area regardless of the area exposed;
   6. the limit on equivalent dose for the hands, forearms, feet and ankles shall be 50 mSv in a calendar year.
## APPENDIX 2

**IONISING RADIATION - HAZARD/RISK MANAGEMENT**

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Possible harm</th>
<th>Model Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Work with ionising radiation</strong></td>
<td>Exposure to radiation which is dependent on the source of radiation. Effects can be short term or long term depending on radiation doses received. The level of harm can range from minor to major/fatal.</td>
<td>Depending on the work exposure to radiation may not be the only hazard, all risks need to be assessed and prioritised. All persons working with ionising radiation must have received training and instruction and should work to a protocol/system of work. Risk assessments need to be carried out. COSHH and Genetic Modification assessment where applicable and appropriate.</td>
</tr>
<tr>
<td><strong>Sealed/closed sources</strong></td>
<td>External hazard only. Dependant on dose rate and exposure time. The level of harm can range from insignificant to major/fatal.</td>
<td>Smallest sources should be used. For sources with a dose rate greater than 1 $\mu$Sv h$^{-1}$ at 10 cms a dose assessment should be carried out. Protection control measures include time, distance and shielding. Use of handling tools, avoidance of direct handling of sources. Classification of working areas. Warning signs. Appropriate supervision, training and instruction. Where provided, dosemeters are used to monitor exposure. Appropriate records for source movements. Disposal via appropriate authorised routes.</td>
</tr>
<tr>
<td><strong>Radiation generators, x-ray diffraction and fluoroscopy</strong></td>
<td>External hazard only. Dependant on dose rate and exposure time. The level of harm can range from insignificant to major/fatal.</td>
<td>Where appropriate, radiation monitoring is to be carried out to ensure that any radiation leakage from enclosed systems is eliminated or minimised to as low as practicable. For sources with a dose rate greater than 1 $\mu$Sv h$^{-1}$ at 10 cms, a dose assessment should be carried out. Protection control measures include time, distance and shielding. Classification of working areas. Warning signs. Appropriate supervision, training and instruction. Where provided, dosimetry is used to monitor exposure. Classification of working areas. Warning signs. Appropriate supervision, training and instruction. Where provided, dosemeters are used to monitor exposure.</td>
</tr>
</tbody>
</table>
| **Open sources** | Weak beta emitters, e.g. H-3, C-14, S-35. Very limited quantities of weak $\gamma$ emitters, e.g. I-125. | External/Internal hazard.  
$<$ 3.7 MBq ($<$ 100 $\mu$Ci).  
H-3, C-14 & S-35.  
$<$ 185 kBq ($<$ 5 $\mu$Ci). I-125. Not a significant hazard. |
| **Open sources** | Significant quantities, e.g. H-3, C-14, S-35 & P-33. >3.7MBq (>100 $\mu$Ci). I-125 and other sources >37 kBq (>1 $\mu$Ci). | External/Internal hazard. The degree of harm is dependant on the quantities involved.  
Smallest quantity should be used. An assessment should be carried out. Protection control measures include time, distance, shielding and minimisation of contamination. Use of handling tools, avoidance of direct handling of sources with high dose rates. Finger TLDs should be used to monitor extremity doses where large quantities greater than 37 MBq (1 mCi) of P-32, I-125 and Cr-51 are used. Classification of working areas. Warning signs. Appropriate supervision, training and instruction. Where provided, dosemeters are used to monitor exposure. Good laboratory practice. Appropriate records for source movements. Disposal via appropriate authorised routes. |

**Note:** Where after a dose assessment has been carried out and there is the potential of the annual effective dose being greater than 6 mSv (whole body) or and equivalent dose of 150 mSv (extremity), the worker will need to be designated as "classified" radiation worker. In this case, the University's Radiation Protection Adviser must be consulted prior to the work commencing.
APPENDIX 3

CRITERIA FOR CONTROLLED AND SUPERVISED AREAS

Controlled Areas

Where it is necessary for any person who enters or works to follow special procedures designed to restrict significant exposure in that area or in which doses of ionising radiation are likely to exceed 0.3 of any dose limit for employees aged 18 years or more as a designated "Controlled areas".

(a) External Radiation Only

Consideration should be made to designating areas as "Controlled" if the measured external dose rate exceeds 7.5 µSv h\(^{-1}\). This criteria is generally applied but some relaxations are allowed if dose rates averaged over one minute do not exceed 2 mSv h\(^{-1}\) and the dose rate averaged over 8 hours does not exceed 7.5 µSv h\(^{-1}\) or only hands can enter places where the dose rate averaged over 8 hours does not exceed 75 µSv h\(^{-1}\) or the dose rate averaged over 8 hours does not exceed 240 µSv h\(^{-1}\) and no person remains in the area for more than 1 hour per 8 hour working day and no persons receives a dose of more than 60 µSv in an 8 hour work period. Where these relaxations are used they must be subject to a proper assessment which takes into account the work likely over a period of one calendar year.

(b) Internal Radiation Only

Areas must be designated as "Controlled" if the air concentration of a radionuclide is sufficiently high enough or if the level of surface contamination is excessive so as to result in an effective dose that can potentially exceed 6 mSv.

(c) External and Internal Radiation

If external and internal hazards may exist then allowance must be made for this in determining the classification of an area.

Supervised Areas

The criteria for areas to be "Supervised" are one sixth of those stated above for Controlled Areas, but if an area would need to be Supervised because of both external radiation and air or surface contamination, or because of both air and surface contamination, then it must be uprated to a Controlled Area.

FOR UNSEALED SOURCES - DESIGNATION BASED ON ACTIVITY USED (LOWER LIMIT)

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>Supervised Area</th>
<th>Controlled Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-3</td>
<td>300 MBq</td>
<td>1.8 GBq</td>
</tr>
<tr>
<td>C-14</td>
<td>100 MBq</td>
<td>600 MBq</td>
</tr>
<tr>
<td>S-35</td>
<td>50 MBq</td>
<td>300 MBq</td>
</tr>
<tr>
<td>P-32</td>
<td>5 MBq</td>
<td>30 MBq</td>
</tr>
<tr>
<td>P-33</td>
<td>40 MBq</td>
<td>240 MBq</td>
</tr>
<tr>
<td>I-125</td>
<td>6 MBq</td>
<td>36 MBq</td>
</tr>
<tr>
<td>Cr-51</td>
<td>40 MBq</td>
<td>240 MBq</td>
</tr>
</tbody>
</table>

Where there is more than one radionuclide, the sum of the fractions need to be less than 1.
# APPENDIX 4

## TABLE OF COMMON RADIONUCLIDES FROM SCHEDULE 8 OF IRR99

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>Regulation 6 and Schedule 1</th>
<th>Regulation 30</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Concentration for notification Bq/g</td>
<td>Quantity for notification Bq</td>
</tr>
<tr>
<td>Tritium (OBT)</td>
<td>$1 \times 10^6$</td>
<td>$1 \times 10^9$</td>
</tr>
<tr>
<td>C-14</td>
<td>$1 \times 10^4$</td>
<td>$1 \times 10^7$</td>
</tr>
<tr>
<td>C-14 dioxide</td>
<td>$1 \times 10^7$</td>
<td>$1 \times 10^{11}$</td>
</tr>
<tr>
<td>Na-22</td>
<td>$1 \times 10^1$</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>Na-24</td>
<td>$1 \times 10^1$</td>
<td>$1 \times 10^5$</td>
</tr>
<tr>
<td>P-32</td>
<td>$1 \times 10^3$</td>
<td>$1 \times 10^5$</td>
</tr>
<tr>
<td>P-33</td>
<td>$1 \times 10^5$</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>S-35</td>
<td>$1 \times 10^5$</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>Cl-36</td>
<td>$1 \times 10^4$</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>Ca-45</td>
<td>$1 \times 10^4$</td>
<td>$1 \times 10^7$</td>
</tr>
<tr>
<td>Cr-51</td>
<td>$1 \times 10^3$</td>
<td>$1 \times 10^7$</td>
</tr>
<tr>
<td>Fe-55</td>
<td>$1 \times 10^4$</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>Fe-59</td>
<td>$1 \times 10^1$</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>Co-57</td>
<td>$1 \times 10^2$</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>Co-60</td>
<td>$1 \times 10^1$</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>Ni-63</td>
<td>$1 \times 10^5$</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>Zn-65</td>
<td>$1 \times 10^1$</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>Rb-86</td>
<td>$1 \times 10^2$</td>
<td>$1 \times 10^5$</td>
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<tr>
<td>Sr-90</td>
<td>$1 \times 10^2$</td>
<td>$1 \times 10^4$</td>
</tr>
<tr>
<td>Tc-99m</td>
<td>$1 \times 10^2$</td>
<td>$1 \times 10^7$</td>
</tr>
<tr>
<td>Cd-109</td>
<td>$1 \times 10^2$</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>In-111</td>
<td>$1 \times 10^2$</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>I-125</td>
<td>$1 \times 10^3$</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>I-131</td>
<td>$1 \times 10^2$</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>Cs-137</td>
<td>$1 \times 10^1$</td>
<td>$1 \times 10^4$</td>
</tr>
<tr>
<td>Th-232 sec</td>
<td>$1 \times 10^0$</td>
<td>$1 \times 10^3$</td>
</tr>
<tr>
<td>U-238 sec</td>
<td>$1 \times 10^0$</td>
<td>$1 \times 10^3$</td>
</tr>
<tr>
<td>Am-241</td>
<td>$1 \times 10^0$</td>
<td>$1 \times 10^4$</td>
</tr>
</tbody>
</table>

**Note 1:** OBT is Organically Bound Tritium

**Note 2:** sec indicates secular equilibrium and the table refers to parent nuclide alone, but already takes into account the progeny nuclide(s) present.