





# HEALTH AND SAFETY SERVICES

WELLBEING, SAFETY AND HEALTH



UNIVERSITY OF LEEDS

## LOCAL RULES FOR THE USE OF UNSEALED RADIOACTIVE MATERIAL FAC???:/SCHOOL???:/GROUP???:

### 1. PURPOSE

The purpose of these local rules is to set out the key arrangements for restricting exposure to ionising radiation in the named research group.

The Local Rules have been written in compliance with regulation 18 of the Ionising Radiations Regulations 2017.

### 2. GROUP AND PERSONNEL

<b>Research Group</b>	
<b>Radiation Protection Supervisor (RPS)</b>	Tel:
<b>TLD Distributor</b>	Tel:
<b>Radiation Safety Coordinator (RSC)</b>	Tel:
<b>University Radiation Protection Manager (RPM)</b>	Andrew Cowling Tel: 34202
<b>University Radiation Protection Adviser (RPA) and Radioactive Waste Adviser (RWA)</b>	Mark Bescoby, Radman Associates

**3. REGISTERED RADIATION AREAS**

Lab/Area	Description	Designation

**4. AUTHORISED RADIONUCLIDES AND LIMITS**

Radionuclide	Total activity of stocks + aliquots	Aqueous waste limit	Solid waste limit	Scintillation waste limit

## 5. MANAGEMENT OF RADIATION WORK

The university's management arrangements for work with ionising radiation are detailed in the following three documents:

- Health and Safety Policy at [http://wsh.leeds.ac.uk/info/137/health\\_and\\_safety\\_policy/125/health\\_and\\_safety\\_policy](http://wsh.leeds.ac.uk/info/137/health_and_safety_policy/125/health_and_safety_policy).
- Health and Safety Standard: Management of Sources of Ionising Radiation at <http://wsh.leeds.ac.uk/download/downloads/id/122/Ionising%20Radiation%20Standard> and accompanying guidance at <http://wsh.leeds.ac.uk/download/downloads/id/123/Guidance%20to%20Standard>

The persons named in section 2 of these rules are responsible for the management and supervision of radiation work in the group as specified in these documents.

## 6. TRAINING AND RADIATION WORK AUTHORISATION

Only persons holding a valid University of Leeds Radiation Work Permit are permitted to handle unsealed radioactive substances.

The authorisation procedures ensure that the person has received sufficient information, instruction and training for the radiation work they will be undertaking.

Instructions to complete training and obtain a permit can be found at

[http://wsh.leeds.ac.uk/info/214/ionising\\_radiation/84/new\\_users\\_of\\_ionising\\_radiation](http://wsh.leeds.ac.uk/info/214/ionising_radiation/84/new_users_of_ionising_radiation)

and a brief summary is as follows:

1. Register on the RSID system at <http://rsid.leeds.ac.uk/>
2. Complete the [Level 1 on-line training course for new users of unsealed sources](#) and a practical session at Health and Safety Services.
3. Complete your local induction training (given by the RPS or a person they nominate) and return the signed ['local training' form](#) to your RSC.

## 7. RISK ASSESSMENT

Risk assessments for unsealed radioactive sources can be found at

[http://wsh.leeds.ac.uk/info/214/ionising\\_radiation/80/open\\_sources](http://wsh.leeds.ac.uk/info/214/ionising_radiation/80/open_sources). The control measures required to address the hazards identified in the risk assessments are detailed in these local rules.

## 8. BEST AVAILABLE TECHNIQUES

The University's permits for radiation work issued under the Environmental Permitting Regulations 2010 specify that 'Best Available Techniques' (BAT) must be used to minimise the radiological impact of discharges on people and the environment.

In summary all radiation users must:

- Justify the use of radioactive material (statement on RSID assessment)
- Minimise the activity and volume of waste arising
- Use the appropriate disposal methods

A BAT statement and guidance can be found at

[http://wsh.leeds.ac.uk/info/214/ionising\\_radiation/80/open\\_sources](http://wsh.leeds.ac.uk/info/214/ionising_radiation/80/open_sources).

## 9. RADIATION AREA CATEGORIES AND ACCESS RESTRICTIONS

Each radiation area must be registered with the RPM and listed in section 3 of these rules.

Areas are categorised based on the level of risk and access restriction required.

The categories are:

<p><b>Controlled Area (Highly restricted access)</b></p>	<p>Access is restricted to authorised radiation workers operating under a specific written system of work for this area.</p> <p>A local access permit is required for service engineers, maintenance contractors, visitors, etc. to enter these areas (issued by RPS or RSC).</p>
<p><b>Supervised Area (Restricted access)</b></p>	<p>Access is restricted to authorised radiation workers.</p> <p>A local access permit is required for service engineers, maintenance contractors, visitors, etc. to enter these areas (issued by RPS or RSC).</p>
<p><b>Undesignated Area (Limited access)</b></p>	<p>Access to these areas is not restricted.</p> <p>All work areas, samples and equipment should be clearly labelled.</p>

## 10. DOSE LIMITS, PERSONAL DOSIMETRY AND DOSE INVESTIGATION LEVELS

### *Dose Constraints*

A dose constraint is a specified limit on the radiation dose that could be received from any planned work with ionising radiation and is used to restrict radiation doses as low as reasonably practicable.

The University's dose constraints for all users of ionising radiation are:

- 1mSv / year whole body dose
- 10mSv / year extremity dose.

### *Personal Dosimetry*

The requirements for personal dosimetry are specified on each worker's Radiation Work Permit.

Workers only using low energy beta emitters do not require personal dosimetry.

Workers who use high energy beta and gamma emitting radionuclides will normally be required to wear extremity (finger stall) TLDs and whole body TLD badges when working with radiation (there

may be exceptions for those only using low activities where the dose assessment has shown that potential doses are much less than the dose meter resolution of 0.1mSv/month).

### ***Extremity TLDs***

Extremity TLDs are worn underneath disposable gloves on the first finger of the dominant hand or two can be worn, one TLD on each hand.

Extremity TLDs are issued monthly and a batch is placed in the group's main radiation lab at the beginning of each month with a list of authorised wearers. TLDs should be returned to the 'used' container after your period of work or by the end of the month (whichever is sooner).

### ***Whole body TLDs***

Whole body TLDs are worn either attached to the lab coat top pocket or trouser belt.

TLD badges are issued quarterly by a local 'distributor', and must be returned on the given dates.

### ***Investigation levels***

Whole body and extremity dose investigation levels are:

- 0.4mSv - a note is made on the dosimetry record
- 0.6 mSv - an investigation is undertaken by the RSC / RPM.

## **11. CONTAMINATION MONITORS**

All monitors are supplied to the group by the RSC or RPM. The correct monitor for each radionuclide is specified in section 13 of these rules. Where  $^3\text{H}$  is being used areas should be frequently swabbed with a Decon (or similar) solution and wipe tests taken and checked by liquid scintillation counting.

Monitors used for contamination and dose rate monitoring must be tested and calibrated annually.

Testing is carried out by the RPM and any monitor used should have a valid calibration label.

## **12. GENERAL WORKING INSTRUCTIONS**

These instructions cover the radiation protection aspects of work with unsealed radioactive material. In addition the user must also follow any other local procedures, e.g. lab protocols, COSHH procedures, instructions for the use of equipment, etc.

The user should also read and follow any supplier's information regarding the use of the material.

The following are general instructions for using radioactive material. Further specific instructions for the radionuclides and techniques used in this group are given in section 13 of these rules.

### ***Personal Protective Equipment (PPE)***

Laboratory coats and disposable gloves should be worn at all times when handling radioactive

material. Safety specs should be worn when appropriate.

### ***Workstation / equipment***

Radioactive work should only be carried out at a suitably equipped 'radiation workstation' that consists of a tray lined with an absorbent layer (e.g. Benchkote) placed on a suitable bench also coated with surface protection (e.g. Benchkote), appropriate shielding and equipment.

Equipment required to be used for sample preparation / measurement (e.g. hybridisation oven, centrifuge, etc.) must be labelled for radioactive work. The label should only be removed and the equipment released for general use after a thorough clean and contamination check.

### ***Handling***

**Time** handling radioactive material should be minimised by rehearsing the technique and ensuring that all equipment is to hand before using the radioactive source.

**Distance** from the radioactive material should be kept to a maximum by using long handled tongs, tweezers and other remote handling techniques wherever possible.

**Shielding** that is appropriate to the radionuclide should be used for the workstation, storage pots, waste containers, etc.

**Contamination** control techniques should be used to minimise the creation and spread of contamination as follows:

- Careful dispensing and handling of any material to minimise the risk of contamination.
- Immediate disposal of any contaminated tips, syringes, etc
- Containment of any samples created in a secondary container such as plastic bag or box.
- Storage or disposal of any stocks and samples not in use as soon as practicable.
- Frequent monitoring of the work area, equipment, gloves, lab-coat, etc. during work.
- Thorough monitoring of the work area, equipment, benches, sinks, fridges, etc, before and after a period of work. A record of the monitoring undertaken after completing work should be made on the lab contamination record sheet.

### ***Storage***

Supplier's information should give recommendations for storage conditions. In particular take note of the recommended storage life of material. Justification will be required to keep material for longer than the recommended life.

Storage of any radioactive material should be in a secure location, i.e. either in a locked laboratory or a locked fridge/freezer/cupboard. Storage locations must be registered with the RPM and listed in section 3 of these rules.

Storage should be in an appropriately shielded container - the original pot is usually adequate for stocks, but aliquots and samples may need further shielding.

There should also be a secondary method of containment so that contamination is limited if the first

container fails (examples are a plastic box, tray or bag)

Radioactive material must be kept separate from non-radioactive samples.

All storage pots and samples must be labelled as radioactive and have their RSID stock or aliquot number marked on them.

### ***Movement and Transport***

Any material that is required to be moved to another lab should be in an appropriately shielded container that is also contained in a sealed plastic box (secondary containment).

RPM advice is required before transporting any radioactive material outside the group's authorised areas.

### ***Waste disposal***

The accumulation and disposal of radioactive waste must be minimised and kept within the limits specified in section 4 of these rules.

The Standard Operating Protocol for radioactive waste is at

[http://wsh.leeds.ac.uk/info/214/ionising\\_radiation/80/open\\_sources](http://wsh.leeds.ac.uk/info/214/ionising_radiation/80/open_sources) and waste routes for this group are summarised below:

*(Delete the paragraphs marked with dotted lines that are not required)*

**Aqueous waste** should be disposed of via a designated sink. Waste should be slowly decanted into gently running water, taking care not to cause splashing. Run the tap for 10 minutes to ensure the radioactive waste clears the sink and trap and then monitor to check the sink is clean. If contamination persists then flood the sink with a 10% Decon solution (or similar) and leave overnight to soak.

**Solid waste** should be disposed of to a **yellow** radioactive waste bag in either a bench top or under-bench waste bin. Minimise radioactive waste disposals by only disposing of contaminated or radioactive items via this route, or items marked with radiation trefoils, hazard warning tape, or the legend 'radioactive'. The waste bag must bear a reference number taken from RSID. At the end of each month (or sooner if the bag is full) all waste bags should be sealed and taken to the waste storage area. Waste bags should be kept within a sealed bin whilst being transported to the waste store.

**Liquid scintillation vials** should be disposed of to a **blue** radioactive waste bag in an under-bench waste bin. The waste bag must bear a reference number taken from RSID. At the end of each month (or sooner if the bag is full) all waste bags should be sealed and taken to the waste storage area. Waste bags should be kept within a sealed bin whilst being transported to the waste store.

**Very Low Level Waste (VLLW)** uranium / thorium compounds and solid alpha-emitting wastes are disposed of via the '**green tag**' waste route. Items should be disposed of to a black bag with a green numbered tag in an under-bench waste bin. Only solid radioactive materials, sediments, liquids absorbed onto paper towel or contaminated disposables are allowed via this route. All other items should be decontaminated and disposed via the usual laboratory waste route. Items marked with radiation trefoils, hazard warning tape, or the legend 'radioactive' should NOT be disposed via this route. The waste bag must bear the relevant reference number taken from RSID. At the end of each month (or sooner if the bag is full) all waste bags should be sealed and taken to the waste storage area. Waste bags should be kept within a sealed bin whilst being transported to the waste store.

### ***Accountancy / ordering / receipt***

All radioactive material receipts, usage and disposals must be recorded on the Radioactive Source Inventory Database (RSID).

The activity of material held must be below the limits specified in section 4 of these rules. To apply for an increase in limits or use of a new radionuclide contact the RSC or RPM.

Before purchasing new material the details must be logged on RSID and approval granted by the RSC.

On receipt new sources must be logged into RSID as soon as possible.

**13. SPECIFIC WORKING INSTRUCTIONS*****Instructions specific to radionuclide***

<b>Radionuclide</b>	<b>Radiation hazard</b>	<b>Shielding required</b>	<b>Contamination monitor required</b>	<b>Personal Dosimetry</b>
H-3	Soft beta	None required	Swabs and liquid scintillation counting	None required
C-14, P-33, S-35, Ca-45 Ni-63 Tc-99	Soft beta	None required	Mini 900EP15	None required
P-32, Cl-36 Sr-90	Hard beta	1cm Perspex required for stock and waste containers. Work behind 1cm Perspex screen or beta-cabinet.	Mini 900EP15	Body and extremity TLDs
Cr-51 Fe-55	Gamma / EC	Lead acrylic or lead, 0.5mm lead equivalence	Mini 900 44B	Body and extremity TLDs
I-125	Low energy gamma	Lead (1mm) required for stock containers. Work behind lead acrylic screen (0.5mm lead equivalence) if handling >3.7MBq quantities	Mini 900 44A	Body and extremity TLDs
Na-22, Fe-59, Cs-137, Co-60	Beta / Gamma	Lead (>15mm) required for stock containers. Work behind lead (>15mm) if handling >3.7MBq quantities - so that dose rates <7.5µSv/h	Mini 900EP15	Body and extremity TLDs
DU, Nat U, Th	Alpha / Beta / Gamma	None required	Mini 900EP15	Body and extremity TLDs

***Additional instructions specific to technique***

*Detail here any instructions or procedures further to those identified in the 'General Working Instructions' (section 12) that are required to restrict exposures for specific techniques.*

<b>Technique</b>	<b>Instructions</b>

## 14. ACCIDENT / INCIDENT REPORTING

Small amounts of contamination that are immediately cleaned up by the worker do not need reporting, providing that there is no residual contamination.

Where incidents occur that involve the contamination of clothing, spillage of large volumes or activities, or more widespread contamination the worker should follow the accident procedures in section 15 of these rules and involve the RPS and RSC. The RSC will then initiate any investigations required and report to the RPM.

## 15. ACCIDENT PROCEDURES (CONTINGENCY PLAN)

- 1) **Do Not Panic.** Verbally warn anyone else in the laboratory. Remain where you are and don't walk around more than is necessary.
- 2) **Deal with life threatening conditions first:** summon someone trained in First Aid if necessary.
- 3) **Stabilise the Situation:** without exposing yourself to further risk, take simple measures to prevent any spillages from worsening. For example, use thick wads of paper towel, absorbent granules (e.g. cat litter) to circle and cover spillages to prevent them from spreading.
- 4) **Monitor yourself:** using an appropriate radiation monitor check yourself (skin, hair, and clothing) for contamination. If your laboratory coat is contaminated take it off and place in a waste bag or out of the way on the floor. Wash your hands thoroughly. If your hair or clothing is contaminated do not panic, you have plenty of time to take action.
- 5) **Prevent Access:** prevent anyone else from coming into laboratory unless they are there to help.
- 6) **Get help:** can another radiation worker in your laboratory help you? Also contact your RPS or the Responsible Person for the laboratory and RSC, or failing that the RPM (x34202).
- 7) **Evacuate:** all work should cease and non-essential workers should leave the laboratory.
- 8) **Monitor Yourself Again:** carry out a thorough contamination check of yourself. Remove any contaminated clothing (within decency) and place in a pile for later inspection. If your skin is contaminated, wash with mild soap and water. Keep washing and monitoring until the skin is thoroughly decontaminated, or until no further contamination can be removed. If contamination remains, contact the Radiation Protection Service for further advice. If larger areas of skin, e.g. the arms, legs or trunk of the body have become contaminated it will probably be necessary to shower. Never use scrubbing brushes, exfoliants or solvents to remove contamination.
- 9) **De-contaminate:** Working with your Radiation Protection Supervisor, put on protective clothing (overshoes, double gloves, whole-body disposable protective suit). Use a radiation

monitor to identify any contaminated areas or equipment. Check the benches, floors, walls, workstations, cupboards, chairs, sinks, taps, door handles, computer keyboards, equipment, etc. Decontaminate using appropriate agents.

Nature of the surface	Decontamination agent
Floors, bench tops, safety screens, plastics, paintwork	Detergents such as Decon®
Metal tools and trays	Dilute acids e.g. sulphuric acid
Glassware	Alkaline detergents, or chelating agents e.g. EDTA
Plastics	Dilute nitric acid (do not use ketonic solvents)

- 10) All solid waste (paper towels, swabs, absorbent materials, and contaminated items) should be placed in yellow solid waste bags. Aqueous waste should be disposed of via the designated sink.
- 11) If contamination remains after cleaning contact the Radiation Protection Service for further advice.
- 12) After the incident has been satisfactorily dealt with you will need to help your RPS to report on what happened via the university's accident reporting system, Sentinel.