

## **CONTINGENCY PLAN: RADIOACTIVE SOURCES**

### **Instructions for the fire brigade and Security Services**

**For key contact information, searching radiation rooms, available radiation detection equipment, and quick instruction on fire fighting**

**→see the appendix to this document.**

## **BACKGROUND**

### **Minor losses or spillages of unsealed radioactive materials**

- 1) The emergency actions relating to spillages of unsealed radioactive materials in laboratories are located in each group's Local Rules.
- 2) This document deals with theft or loss of, or significant damage to radioactive sources or to radiation facilities.

### **Responsibility for Sources of Ionising Radiation**

- 3) Statutory responsibility for the safekeeping of radioactive materials lies with the Radiation Employer, which at the University of Leeds is deemed to be the management chain from Head of School to Council. However, all employees and students (including research students) have personal responsibility for the conduct of their work, working in accordance with established health and safety standards and for matters of governance. Duties and responsibilities are laid down in the University's Health and Safety Policy and in the Radiation governance arrangements briefing paper.
- 4) Having stated this, incidents do occur, and so, in order to protect people and the environment from the potential consequences, and to maintain business continuity it is vital that all persons who have a part to play in any intervention or 'recovery' act in a consistent manner and follow a considered plan of action, and also communicate effectively to the right people. The purpose of this document is to define the procedures to be followed in the event of a significant incident.

## **ACTIONS TO TAKE IN THE EVENT OF THE LOSS OR THEFT OF A RADIOACTIVE SOURCE: UNSEALED (INCLUDING SAMPLES), SEALED SOURCES OR HASS**

- 5) If it is suspected that a radioactive source has been lost or stolen the following must be notified immediately by telephone, with a follow-up email;
  - the local Radiation Safety Coordinator (RSC),
  - the Radiation Protection Service (Ian Haslam x34203, Andrew Cowling x34202, switchboard x34201; [radiation@leeds.ac.uk](mailto:radiation@leeds.ac.uk))
- 6) With the assistance of the Radiation Protection Service, the RSC should coordinate an immediate search for the missing material interviewing the source users and also using monitoring equipment (if appropriate) as an aid to finding the source by detecting its radioactive emissions.
- 7) When undertaking a preliminary search to attempt to recover missing radioactive materials, the RSC / users should consider
  - where and when the source was last seen or used,
  - the possibility of the source having been 'borrowed',
  - whether the source had been locked in a fridge or room, and who has access to the secure location,
  - the likelihood of the source having been dropped or left unattended during transit between areas,
  - the likelihood of the source having been stored in an incorrect location (all cupboards and shelves should be searched).
- 8) RSCs should arrange for room entry records (Simons-Voss) to be made available for inspection as soon as is reasonably practicable.
- 9) The RSC should report the findings of the preliminary search to the Radiation Protection Service by word of mouth within two hours and by email as soon as is reasonably practicable.
- 10) The conditions of the permits issued by the Environment Agency require the University (i.e. the Radiation Protection Service) to notify the Agency without delay if;
  - a malfunction or mechanical damage, or failure of a technique has caused a source to become damaged, or if environmental contamination is suspected.
- 11) The permit conditions also require the University (i.e. the Radiation Protection Service) to immediately notify the Agency and the Police (through Security Services) of;
  - the loss or theft (or attempted theft) of a radioactive source.

### **Indicators of the loss or theft of sealed radioactive sources from laboratories & other research areas**

- 12) The types of Sources held by Faculties on a permanent basis are mostly fitted to instruments and include liquid scintillation counters, atmospheric neutralisers, and electron capture devices. These items are fixed in place or used in dedicated areas, and as such their absence should prompt grounds for concern.
- 13) Sources issued on a periodic basis include teaching sources, instrument test sources and mobile

sources such as the moisture gauge. These items are mostly logged on a daily basis and their use is continually supervised (unattended use is prohibited), thus the absence of a source from a location specified in the record should prompt immediate concern.

#### **Indicators of the loss or theft of HASS and stored sealed radioactive sources**

- 14) High activity sealed sources (HASS) are only used by the Radiation Protection Service, who also have the sealed source stock held in a secure location.
- 15) The inadvertent loss of a HASS source is not possible as the escape of a source from the shielded containment would sound the gamma alarms.
- 16) When in use the HASS are continually supervised, and when not in use are subject to electronic monitoring. Indicators of attempted or actual theft would include the gamma alarms sounding and the site security alarms being activated. There would also be physical signs of attempted theft such as damage to the source store door.

#### **Indicators of the loss or theft of unsealed radioactive sources**

- 17) Unsealed radioactive sources are held in lockable fridges / store cupboards or in laboratories secured by electronic access controls, and so the signs of an attempted theft should be obvious.
- 18) The signs of loss radioactive materials could include irreconcilable records between physical holdings and the RSID inventory.

#### **ACTIONS TO TAKE IN THE EVENT OF A FIRE OR FIRE DAMAGE TO RADIOACTIVE SOURCES: UNSEALED, SEALED OR HASS**

- 19) The likelihood of a fire in a laboratory cannot be discounted, and it is therefore important that the correct actions are followed in order to ensure the effects of fire are not worsened and / or minimise the effects of radioactivity released by fire.
- 20) No attempt should be made to rescue radioactive sources from a lab that is on fire, or wherein a fire is suspected. Follow procedures outlined in your fire safety training.
- 21) If a fire is sufficiently severe some of the radioactive materials will be released as volatile products or smoke, and will be dispersed in the flames / smoke, and some materials will be retained in the fire-damaged residues of fridges and source stores.
- 22) In the aftermath of a fire, laboratories containing radioactive materials should not be entered and the RSC should ensure they are sealed off.
- 23) If the Fire Service has flooded a radiation laboratory with water the RSC will ensure that all areas subject to this flood damage are kept out of bounds until contamination surveys have been carried out.
- 24) The Radiation Protection Service will undertake the necessary contamination surveys and follow-up decontamination actions before any other persons are permitted access to exclusion zones. The Service

will liaise with Estate Services to erect supplementary containment barriers, and will use specialist equipment to undertake an intervention.

- 25) The Radiation Protection Service will notify the Environment Agency and the Police (through Security Services) immediately if fire damage is suspected.

## **ACTIONS TO BE TAKEN FOLLOWING THE FLOODING OF RADIATION AREAS: SEALED SOURCES AND HASS**

### **Likelihood of damage**

- 26) Storage containers, outer containers and the capsules of sealed sources and HASS provide sufficient protection from the immediate effects of flooding or water damage. However, sources that have become wet or become damp are potentially vulnerable to corrosion and physical damage, more so when flooding has been turbulent or has included debris.

### **Interventions**

- 27) In the event of local flooding (leakage in the laboratory) or the ingress of flood water resulting from bad weather, users and RSCs should collect the sources in a secure dry location and notify the Radiation Protection Service.
- 28) When collecting the sources it should be assumed that they have been damaged, and so appropriate PPE must be worn (double gloves, lab coats and safety glasses), the sources must be placed in deep lined trays, and contamination monitoring undertaken.
- 29) If contamination is found the users / RSC should leave the sources at the location, cordon the area off and contact the Radiation Protection Service immediately.
- 30) If contamination is not found the Radiation Protection Service will arrange for the sources;
- to be tested to confirm they aren't leaking, and,
  - thoroughly dried, cleaned and their condition tested.

## **ACTIONS TO BE TAKEN FOLLOWING THE FLOODING OF RADIATION AREAS: UNSEALED SOURCES**

### **Likelihood of damage**

- 31) When not in use unsealed sources should be held in leak-proof containers in fridges or storage cupboards. Radioactive materials are not permitted to be left on open benches overnight. Consequently it is highly unlikely that unsealed radioactive materials will be affected by local flooding.
- 32) There is, however, the possibility that samples, gels / blots, or labelled products may become water damaged, even if held in storage cupboards. Fridge / freezers that defrost may also cause such materials to become water damaged.

## **Interventions**

- 33) In the event of a laboratory, facility or fridge / freezer containing unsealed sources or materials being subject to water damage or defrosting in the case of the latter, the user should notify the RSC immediately and make arrangements for the room or item of equipment to be cordoned off. If water ingress or leakage is continuing barriers (temporary bunds) should be laid down to contain the water flow.
  - Paper towels, lab coats or other absorbent materials are suitable for this purpose.
- 34) The user and RSC should monitor the area to establish whether there is contamination (where tritium is involved wipes should be taken for liquid scintillation counting).
- 35) The Radiation Protection Service should be notified immediately. They will coordinate a clean-up and any necessary decontamination work.

## **Failure of the plumbing system**

- 36) If it is suspected that there are broken pipes or taps that are releasing water into a room then an Estate Services plumber should be allowed access. The user or RSC should equip the plumber with PPE and work alongside them, monitoring for contamination.
- 37) After completing any emergency work, any persons involved should be monitored head-to-toe for contamination. If clothing has been found to be contaminated it should be removed and left in the room. The affected person should be monitored again and if their skin is contaminated they should wash or shower as appropriate using soap (not disinfectants or surfactants).
- 38) The Radiation Protection Service should be notified immediately.

## APPENDIX: CRUCIAL INFORMATION

### IMPORTANT CONTACT NUMBERS

Service	Telephone	email
Department of Wellbeing, Safety & Health switchboard	0113 34 34201	<a href="mailto:radiation@leeds.ac.uk">radiation@leeds.ac.uk</a>
Ian Haslam (Head of Radiation Protection)	0113 34 34203 07800 963148 (emergencies)	<a href="mailto:radiation@leeds.ac.uk">radiation@leeds.ac.uk</a> , or <a href="mailto:i.k.haslam@leeds.ac.uk">i.k.haslam@leeds.ac.uk</a>
Andrew Cowling (Radiation Protection Manager)	0113 34 34202 07506 707342	<a href="mailto:radiation@leeds.ac.uk">radiation@leeds.ac.uk</a> , or <a href="mailto:a.cowling@leeds.ac.uk">a.cowling@leeds.ac.uk</a>
Security Services	0113 34 32222 (emergencies) 0113 34 35494 (non-emergencies)	<a href="mailto:security@leeds.ac.uk">security@leeds.ac.uk</a>
Estate Services helpdesk	0113 34 35555	<a href="mailto:eshelp@leeds.ac.uk">eshelp@leeds.ac.uk</a>
Environment Agency incident hotline (24 hr service) <b>The Environment Agency must only be approached through the Radiation Protection Service.</b>	0800 807060	

### EMERGENCY EQUIPMENT

<b>Equipment location</b>	<b>Radiation Protection Service: office</b> <b>Department of Wellbeing, Safety and Health</b> <b>Room 2.04, 5-9 Willow Terrace Road</b> [Accessible 24/7 by Service staff and Security Services]
<b>Item</b>	<b>Contents</b>
Black Peli Storm Case (large)	<b>Hand held monitoring kit</b> 1 x Mini 1000 minirad (dose rate monitor) 1 x Mini Instruments type 900D (dose rate monitor) 1 x Mini Instruments type 900EP15 (beta detector) 1 x Mini Instruments type 900 / 44B (x-ray, gamma & EC detection) 1 x Mini Instruments type 900 / 42 (x-ray, gamma detection).
Black iSeries SKB Waterproof Case (small)	<b>Wide area dose rate monitoring system</b> 1 x Radcal Accupro & 0.68 cc ion chamber
Silver case	<b>Leak test / tritium monitoring kit</b> Lab Logic wipe papers & fluid Glass fibre filters Nitril gloves Overshoes

	Disposable contamination suite Paper role / tissues
Dacoma Spill Responder shoulder bag (yellow)	<b>50 litre spill kit</b> 4 x Bunds 2 x Absorbent pillows Absorbent pads Yellow & blue radioactive waste bags

<b>Equipment location</b>	<b>Radiation Protection Service: laboratory</b> <b>School of Food Science &amp; Nutrition</b> <b>Room G.06, Willow Terrace Road</b> [Accessible 24/7 using pass card held in Service office]
<b>Item</b>	<b>Use</b>
Lab Logic single cell portable liquid scintillation counter	For the counting of surface wipes, particularly in the detection of tritium and carbon-14.
Bicron G2 2" x 2" NaI crystal scintillation detector & OI PCA-P-Plus MCA card	To perform spectral analyses on unidentified radioactive samples.
Bicron G2 2" x 2" NaI crystal scintillation detector & Bicron labtech scalar	To perform activity analyses.
High standard radiochemistry laboratory	Fume cupboard, high performance furniture & fittings, radiation safety equipment & shielding suitable for radiochemistry analytical work.

## INSTRUCTIONS FOR THE FIRE SERVICE (& SECURITY SERVICES)

### HASS radiation source store (Worsley Building)

- 39) Security Services know the location of this facility, which they keep under continual surveillance.
- 40) HASS sources are held in a secure area within a purpose built relatively isolated source store. The sources themselves are encased in <40 cm diameter lead pots or similar.
- 41) In the event of a **short fire** these would not be expected to be seriously damaged. The instruction is to **fight the fire**.
- 42) In the event of a **prolonged fire** of high intensity it is highly unlikely the sources would be seriously damaged. The instruction is to **fight the fire**.

### All radiation Supervised Areas across campus (the highest risk category permitted)

- 43) Radiation laboratories identified as being Supervised Areas only contain **small quantities** of radioactive materials, and these will be stored in fridges or freezers. Most of these will be sited underneath the lab benches.

- 44) In the event of a **short fire** the fridges & freezers may be damaged or may melt. Radioactive materials would be expected to become incorporated into the fabric of the fridge / freezers. The instruction is to **fight the fire**.
- 45) In the event of a **prolonged fire** of high intensity it is highly unlikely the sources would boil off inside the melting fridge / freezers and escape in the smoke. The risk of radiation exposure is low and normal precautions for fighting fires in smoke filled environments will provide adequate protection to fire fighters. The instruction is to **fight the fire**.

## INFORMATION FOR SECURITY SERVICES

### Entering & searching ionising radiation laboratories

#### *Supervised Areas: unsealed radioactive materials*

- 46) Radioactive substances in the form of liquids and powders are used in Supervised Areas. These areas can be recognised by the following types of sign:

#### Caution sign



Caution – radiation  
Supervised Area  
Low risk  
Unsealed sources



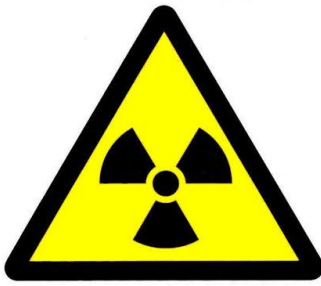
Access controlled  
In an emergency  
(e.g. fire alarm, flood)  
this lab may be entered  
[www.leeds.ac.uk/rps](http://www.leeds.ac.uk/rps)

Lab:  
For access contact:  
Radiation Safety Coordinator:

- 47) Labs bearing the ‘**caution**’ sign may be entered by any member of staff in order to take emergency or preventive action, e.g. to investigate a fire, carry out emergency plumbing or electrical work, to turn off running taps, investigate floods, etc.
- 48) When not in use all radioactive materials will be stored in cupboards, fridges and freezers, and will not be out on benches. Although care must be taken when opening fume cupboards.
- 49) The level of risk is low.
- 50) All rooms are checked regularly to make sure they are safe and there is no contamination on floors, in sinks, etc.



## Warning sign



Warning – radiation  
Supervised Area  
Moderate risk  
Unsealed sources

RESTRICTED AREA  
Unauthorised entry  
is strictly forbidden



Lab:  
For access contact:  
Radiation Safety Coordinator:

- 51) Labs bearing the '**warning**' sign may be entered by an authorised person only. Authorised persons include Estates Services engineers, plumbers, etc. and Security Services personnel who need to take emergency or preventive action, e.g. to investigate a fire, carry out emergency plumbing or electrical work, to turn off running taps, investigate floods, etc.
- 52) The reason for the higher level of restriction is on security grounds and not for reasons of radiation safety.
- 53) When not in use all radioactive materials will be stored in cupboards, fridges and freezers, and will not be out on benches. Although care must be taken when opening fume cupboards.
- 54) The level of risk is moderate. This means that plumbers should take extra care if dismantling sink drains or tapping into waste water systems.
- 55) All rooms are checked regularly to make sure they are safe and there is no contamination on any accessible surfaces.

### **Entering and searching x-ray laboratories**

- 56) X-ray systems of the type used at the University are inherently safe and do not present any risk of radiation exposure. If access is restricted it is not for reasons of radiation safety.
- 57) In the event of flooding care should be taken as many x-ray systems are always powered up, and in an emergency scenario there could be a risk of electrocution. If at all possible power should be interrupted if flooding is suspected.