



## Community Services: Education

Argyll House  
Alexandra Parade  
Dunoon PA23 8AJ

To: Heads of all Educational Establishments

Dear Colleague

### **Radiations in schools**

- 1 The maximum activity of all sealed radioactive sources held must not exceed 1.1 megabecquerels and no single sealed source may exceed 370 kilobecquerels.
- 2 Apparatus capable of generating X-rays operating at 5 kilovolts or more (other than a cathode ray oscilloscope, television receiving set or visual display unit, used in the normal way for viewing) must not be used.
- 3 Pupils under the age of 16 must not be allowed to undertake experiments with ionising radiations. In these circumstances experiments shall be by demonstration.
- 4 In each school there shall be a 'radiation protection supervisor' (RPR) to manage arrangements for work carried out with radioactive sources.
- 5 Sources of ionising radiation must be stored in a suitable container within a locked store. Head teachers must confirm the level of radioactive material within their school to the designated person within Community Services on request. A register of volume of material and location must be established. Schools where there are no radioactive materials in place must also confirm this.

A radioactive sources record book must be maintained giving details of the following:

- i date of authorisation to hold sources;
- ii date of receipt of each source; schools must have an estimated year of purchase given to them by Jim Jamieson (SSERC) undertaking the national survey of schools (this must be in all record books);
- iii name and activity of each source (as at original date);

- iv existing stock (revised whenever a source is bought or disposed of); stock must be checked monthly, except in the summer holidays;
- v date of notification to Strathclyde Fire and Rescue Service'
- vi details of annual leakage tests (date, source, result, action, signature);  
an addition, on each occasion when any source is removed for teaching purposes the following information must be recorded;
- ix date;
- x name and strength of source;
- xi signature (both for withdrawal and return).

Two sets of records are required. One is the 'Record and management list' attached as appendix 1 and the other is a logbook to keep a record of withdrawals from the store and monthly stock checks. The logbook should have columns for (1) date of entry, (2) either source name and activity or 'stock check', (3) initials or signature.

- 9 The store and cupboard used for storing the sources must be clearly marked with an appropriate hazard warning label. The location of this store must be made known to the Strathclyde Fire and Rescue Service.
- 10 A poster is attached as appendix 2 which must be printed off and displayed clearly near to storage area.

Yours sincerely

Executive Director of Community Services  
March 2010

## Appendix 1: working with radioactive substances - record and management list

### Responsibilities

The responsible person should be someone who works with radioactive materials and has some understanding of radiological protection. Your employer may appoint a Radiation Protection Supervisor (RPS) to manage working with radioactive substances. However there is no legal requirement under IRR99 for a school to appoint an RPS. In most schools the dutyholder will be the PT Physics, or another physics teacher.

This form should be used as a record and audit by the teacher responsible for managing work with radioactive materials or RPS. Entries can be made electronically. A paper record should be kept for a period of at least 3 years.

School	
Date	
Headteacher	
Teacher responsible for managing work with radioactive materials, or Radiation Protection Supervisor	
Council manager	Fiona Campbell, QIO Email: <a href="mailto:fiona.campbell@ea.argyll-bute.sch.uk">fiona.campbell@ea.argyll-bute.sch.uk</a>
Radiation Protection Adviser	Jim Jamieson SSERC Tel: 01383 626070 Email: <a href="mailto:jim.jamieson@sserc.org.uk">jim.jamieson@sserc.org.uk</a>

### Stock list

Use *A sourcespotter's guide to radioactive materials* to identify what you are holding. The *Source type* column should include the source reference number from the guide.

Activities should be recorded in SI units. The kilobecquerel is the commonly-found multiple. To convert from curies, 1 mCi is equivalent to 37 kBq. Record the activity as it was at the time of purchase. Do not allow for any reduction of activity from ageing.

Use the *Identification mark* column to distinguish between similar sources. Some sources have a unique ID mark engraved on them by the manufacturer. If the source is very small, you would need a magnifying glass to read it.

If you do not know when a source was purchased, please estimate the year of purchase. Show this by adding the letter "E" after the year.

When recording an open source, enter the mass and compound name in the *Activity* and *Identification mark* columns.

Stock should be checked every month except in the summer vacation. The record of checks should be kept in the log book.

Please record details of all radioactive materials held by the Science Department (an example of what your records should look like is shown in the first three rows):

Source type	Nuclide	Activity (kBq)	Identification mark	Supplier/Make	Year of purchase
Sealed source 1.1	Ra-226	185	A3608	Griffin	1985E
Sealed source 1.9	Sr-90	74	OT 675	AEA	2008
Cs-137/Ba-137m Isotrak Generator 5.4	Cs-137	37	FS 105	AEA	2008

## Disposals

In the sixth column, please state how the source was disposed of:

- 1 to an authorised disposal contractor (e.g. SSERC),
- 2 returned to supplier,
- 3 as refuse to school dustbin,
- 4 to foul-water drain.

In the case of (1) or (2) above, please name the contractor or supplier.

Please ask your RPA for advice on disposals.

## Storage

See *Radioactive Source Storage* (July 2003).

Sources must be stored in a lockable, steel cabinet secured to the building.

Warning labels must show the standard pictogram for ionising radiations. If the storage cabinet is in a cupboard, both the cabinet and cupboard doors should be labelled. If the storage cabinet is in a room, then the doors of the room do not need warning labels provided that the cabinet labels are easily seen from a distance.

Gamma sources should be sited at the rear of the storage cabinet.

Sealed sources should be kept within proper receptacles.

If the storage cabinet is in a room where staff work, the exterior dose rate should not exceed  $2.5 \text{ mSv h}^{-1}$ . This condition is met by placing gamma sources more than 20 cm back from the cabinet door.

Distances refer to the separation in metres between the storage cabinet and any place where an employee or pupil habitually works or sits.

Unless there is extra shielding, the distance should be at least 1.5 m from where a pupil sits, 2.5 m from where a teacher sits and 3 m from where a technician routinely works.

No one working on the floor above or below the store would be at risk.

These safe working distances can be reduced by shielding gamma sources with a brick.

Please record any disposals of radioactive materials made during the two-year period up to the time of completing this record form:

<i>Source type</i>	<i>Nuclide</i>	<i>Activity (kBq)</i>	<i>Identification mark</i>	<i>Supplier</i>	<i>Disposal route</i>	<i>Disposal date</i>

Please confirm that storage arrangements are proper. Comment if needed.

	<i>Arrangements</i>
Store location	
Nature of cabinet (lockable, steel cabinet secured to building)	
Depth of cabinet Interior layout and shielding	
Sources kept in receptacles	
Exterior dose rate within limit (estimate)	
Warning labels on cabinet and storeroom (if needed)	
Distance of store to nearest pupil	
Distance of store to nearest teacher	
Distance of store to nearest technician	

## Working procedures

See *Risk assessment ... on sealed sources* (Oct 2003).

A log book must be kept to record the withdrawal of sources from the store.

Stock should be checked every month except in the summer holidays. The record of checks should be kept in the log book.

Risk assessments are available from SSERC on the use of:

- Amersham sealed sources;
- AEA Isotrak Cs-137/Ba-137m Isotope Generator;
- Cooknell Ionisation Chamber with thoron generator; and
- geological specimens of radiological minerals.

These should be studied and adapted for your own school.

Risk assessments should be made for a student doing an Advanced Higher Investigation, but dose estimates are not needed.

Beta sources are the main risk of high dosage to the user. Limit irradiation by standing behind the source and using a perspex screen.

Note restrictions on children under 16 and classes taught by trainee teachers.

Review arrangements for the security of radioactive sources.

## Information and instructions

In safety management it is generally easier arranging for technical matters than personnel. Persons who may be at risk and in need of information, instructions and supervision include:

- physics teachers;
- teachers of other sciences;
- new teachers;
- temporary teachers;
- probationary teachers;
- student teachers;
- technicians;
- other employees;
- pupils;
- expectant or breastfeeding mothers.

Each may need separate arrangements. The RPS (or equivalent) is responsible for this.

Please confirm that the following procedures are in place

<i>Procedure</i>	<i>Confirmation</i>
Maintenance of log book	
Monthly stock check noted in log book	
Advanced Higher Investigations: risk assessments made and logged	
Perspex sheet available for screening beta sources	
Practical work by children with radioactive materials is not undertaken in classes where anyone is under the age of 16	
Student teachers are not left unsupervised	
The protactinium generator has been withdrawn from use and is awaiting disposal	
Security arrangements reviewed	

Please confirm the following

<i>Detail</i>	<i>Confirmation</i>
<i>Safety Arrangements on Working with Radioactive Sources – What you should know and do on display in staff area</i>	
The set of safety notes on working with radioactive materials has been downloaded from the SSERC website	
Information or instructions issued to teaching and non-teaching staff as appropriate	

## Training

Employers have a responsibility to ensure that employees have been given adequate training for purposes of health and safety. An employer's obligation to train extends in particular to those employees who manage or supervise the use of work equipment. In this instance *work equipment* means *radioactive sources and substances*.

Keep a note of the staff training record, including technician training

<i>Member of staff</i>	<i>Training course</i>	<i>Year of training</i>

## Contingency plan

See *Contingency plans* (Sept 2006)

You are required by law to prepare contingency plans. Your RPA has prepared a set of generic plans and these may be downloaded from the SSERC website. The plans cover fire, loss, interruption by a fire alarm, irregular holdings and acquisitions, irregular practices by employees, contamination and pupil indiscipline. Please check through the plans, adopting or adapting them as need be.

You must have the name and telephone number of a hospital for providing advice in the event of an accident. The list of major receiving hospitals for radiation casualties can be found on the SSERC website and in Bulletin 214.

The Fire Officer should be notified of the location of the radioactive source store.

The head teacher and school safety committee should be made aware of your health and safety arrangements for complying with the Ionising Radiations Regulations.

Note any unusual occurrences, appending a report if necessary.

Please record your contingency plan arrangements

<i>Contingency plan arrangements</i>	<i>Note or comment</i>
Plans downloaded from SSERC website and adopted or adapted	
Name of designated hospital Telephone number	
Store location details given to Fire Officer	
Staff informed of contingency plan and given appropriate instructions	
Record of unusual occurrences	

## Leak testing

See *Protocol on ageing and leak testing sealed radioactive sources* (Aug 2007)

To prevent radioactive contamination, sources should be in a sealed form whenever practicable. The term *sealed source* was redefined in IRR99 to mean any radioactive substance whose structure is designed to prevent, under normal conditions of use, any dispersion of radioactive materials into the environment.

The law says that if it is practicable to carry out a leak test on a source, then it must be so tested, at least once every 24 months.

The test on school sources has been changed from an absolute test to a relative one. Any test instrument may be used provided that it is adequate and efficient.

A wipe test is used excepting on a Ra-226 source. If the mean count from the wipe is more than 2 standard deviations of the difference between the count and background, then the source should be considered suspect. The calculation should be done on a spreadsheet downloaded from the SSERC website.

If a test shows a fail, repeat the counting and reanalyse. If it fails a second time, ask your RPA for help.

Radium-226 sources should be tested with the radon emanation test. A value of 40 counts (500 s)<sup>-1</sup> is acceptable for the average corrected count from the radon emanation test.

The eluate from a Cs-137/Ba-137m Isotope Generator should be tested for bleedthrough of Cs-137 every 24 months.

Because sources are likely to leak eventually from ageing, older sources should be leak tested annually instead of biennially. For Co-60, Pu-239 and Ra-226 sources, these should be tested annually from 5 years of age. For other sealed sources, test annually from 10 years of age.

If a source has been dropped onto a hard floor or physically abused, it should be leak tested as quickly as can be arranged.

Enter details of the counter

<i>Equipment</i>	<i>Details</i>
Type of GM tube and counter used in leak tests	
GM tube shown to be in efficient working order (for instance, is the mean background count about normal?)	

Leak test results:

<i>Test date</i>	<i>Nuclide</i>	<i>Activity (kBq)</i>	<i>Source ID</i>	<i>Reason for test</i>	<i>Test result</i>	<i>Action</i>

*Notes on completing this Record and management list:*

The file is Microsoft Word. Entries can be made by keying your responses into the tables, or printing out the form and entering in manuscript.

The form should be redone as often as you find appropriate. This might be annually, biennially, or whatever. Because of electronic entry, the task of redoing the form should be relatively simple.

# What you should know and do

# WORKING WITH RADIOACTIVE SOURCES

## Safety Arrangements

### General

The legal duties of an employee include:

- **taking reasonable care** for your own health and safety and that of others who may be affected by what you do or do not do;
- **co-operating with your employer** on health and safety;
- **correctly using work items** provided by your employer, including personal protective equipment, in accordance with training or instructions; and
- **not interfering with or misusing** anything provided for your health, safety or welfare.

### Scope of permitted work

The only kinds of **radioactive substances** which may be used are:

- sealed sources with an activity no greater than 370 kBq of the nuclides Am-241, Co-60, Cs-137, Pu-239, Ra-226 and Sr-90. (The activity of all of them should not be above 1.1 MBq.)
- AEA Isotrak Cs-137/Ba-137m Isotope Generator (33 kBq version).
- Cooknell Ionisation Chamber with thoriated gas mantles.
- Geological specimens.
- potassium and its compounds.

You are not allowed to work with **x-ray machines**, nor to experiment with electron beams in a vacuum at potentials exceeding 5 kV.

### Ethical principles

Never work with radioactive substances unless:

- **you have a good reason** (for instance, to make an educational point such as illustrating a physical law, or demonstrating a safety arrangement);
- **you minimize the dose** to yourself and others as far as practicable while allowing pupils to see the procedure;
- **you keep well within limits** regarded as being tolerable.

### Working procedures

- **Never directly handle radioactive sources** unless the source has been designed to be handled.
- **Handle** sources with tongs, tweezers or handle.
- **Carry** the source in its box or pot on a tray.
- When using a sealed source, **do not direct the source at yourself or anyone nearby**. While manipulating the source, **stand to the side of, or behind, the source**. When the source is in use, **stand back**.
- When using a beta source, **screen the source** with perspex.
- **Keep sources in the locked store** except when in use.
- **Make a record** in the logbook of every usage of radioactive substances.
- In any class where pupils are under the age of 16, practical work with radioactive sources is restricted to **teacher demonstrations**.
- Before any student can work with radioactive sources, they must be **informed** of the working procedures, **shown** what to do and **supervised throughout**.
- If a student wishes to do project work with radioactive substances, a **risk assessment** must be made, but you do not need to estimate the dose to the student, or others who may be affected by the work.
- Check **stock monthly** (except in the summer holidays), keeping a record in the logbook.
- **Test sources for leakage** at least every 2 years.

### Risk assessment

- Provided that the proper working procedures are followed, the whole body dose to the experimenter is of the order of 100 nSv per demonstration for beta or gamma emitters, and rather lower to pupils watching the demonstration.
- ICRP considers that the effects of any dose less than 10 mSv are likely to be negligible.
- The typical indoor dose rate from background radiation is 270 nSv/h.

**Supervisory teacher:** [Add]

**Radiation Protection Adviser:** Jim Jamieson

Tel: 01383 626070

Email: jim.jamieson@sserc.org.uk

**Nominated hospital:** Hospital nominated by local doctor

## **Appendix 3: management of work with radioactive sources in schools**

### **Radiation employer**

Education employers are *radiation employers*, a term defined in health and safety regulations, if in the course of their business a school under their control carries out demonstration experiments with radioactive materials. It follows that all 32 Scottish councils and the companies or trusts controlling many independent schools are radiation employers.

A radiation employer has to comply with certain duties made under the Ionising Radiations Regulations 1999 (IRR99), the most significant of which is the need to set up and manage health and safety arrangements, delegating duties and responsibilities down the line to employees. There should be a clear chain of command from the directorate to the teachers and technicians.

The Management of Health and Safety at Work Regulations 1999 require employers to manage health and safety. The duties of the Management Regulations overlap with the Ionising Radiations Regulations.

### **Radiation Protection Adviser**

A requirement of the Ionising Radiations Regulations is that a radiation employer must appoint a Radiation Protection Adviser (RPA) to advise them with their work. As from 1 January 2005 the person appointed must be qualified to work as an RPA under a scheme known as RPA2000 run jointly by the Health and Safety Executive and the Society for Radiological Protection. One of the SSERC staff members, Jim Jamieson, Physics Senior Associate, has this qualification. Mr Jamieson is the RPA (a personal appointment) for all 32 councils, many independent schools and some FE colleges. Anyone seeking advice on radiological protection or radioactive sources should contact him at SSERC.

### **Radiation work management**

There are essentially two parts to this. Firstly the Council directorate must assign the duty of supervising work in schools to a suitable person in the Council management. A list of duties which that person should undertake can be found in table 1. They include checking that in each school one of the teachers has been delegated to manage health and safety arrangements with radioactive materials and so on, and exercising just sufficient supervision to ensure that these safety arrangements are actually being managed and complied with.

<b>Ref</b>	<b>Duties of Council or school management</b>	<b>How often</b>
1	To check that a teacher has been delegated to manage health and safety arrangements with radioactive materials.	1
2	To check that each school's radioactive sources are kept in a suitable locked store.	1
3	To check that the location of the store is at least 2.5 m distant from where staff habitually work, or at least 1.5 m from where pupils sit.	5
4	To check that the store is marked with the appropriate warning sign.	5
5	To check that sources in the store are kept in suitable receptacles.	5
6	To check that gamma sources are kept at least 20 cm back from the cabinet door, or shielded with a brick.	5
7	To check that an accounting record of holdings of radioactive materials is kept and updated regularly, as to be advised. At present, stock should be checked monthly, except in the summer vacation.	1
8	To check that the accounting record is accurate.	1
9	To check that the radioactive materials held comply with the Scottish Government's approved list.	1
10	To check that a log of usage is maintained.	1
11	To check that radioactive sources are leak tested at least once every 2 years (preferably annually if the source is aged).	1
12	To check that a suitable perspex screen is available and used to screen beta radiation.	5
13	To check that children under the age of 16 do not work with radioactive sources.	5
14	To check that there is a risk assessment for any Advanced Higher Investigation with radioactive sources.	1
15	To check that 'Safety Arrangements: Working with radioactive sources: What you should know and do' is displayed on a science department notice board and has been brought to the attention of staff.	5
16	To check that at least one teacher has had relevant safety training within the last 5 years on working with radioactive sources in school laboratories.	5
17	To check on the training that each teacher has been given.	5
18	To arrange that any student teacher working with radioactive sources is continuously supervised by a qualified teacher.	5

Ref	Duties of Council or school management	How often
19	To assist the school set up contingency plans, and review the plans periodically.	5
20	To ensure that every school knows which of their neighbouring hospitals to contact in the event of a radiation incident.	
21	To tell the Fire Officer where radioactive sources in the Council's schools are kept.	
22	To arrange any disposals through SSERC.	
23	To manage any emergency incident.	

**Table 1** Supervisory duties of Council or school management.

How often: "1" = once a year, "5" = once every 5 years

### **Radiation Protection Supervisor (RPS)**

The second part of management is the delegation of management duties to a suitable teacher in every school with radioactive materials. Generally the job should be given to the PT Physics, but, where schools do not have a PT Physics, the appointee should be either a teacher of physics or chemistry – the important point being that the postholder should know about radiological protection<sup>1</sup> and have an ongoing experience of working with radioactive sources.

The school appointee does not need, in the legal sense of the term, to be called the *Radiation Protection Supervisor*. Nonetheless, because this title accurately describes the job function, it is a good one to use. A teacher who is made an RPS is more likely to take his or her supervisory responsibilities seriously than one who doesn't have a special title.

### **Teachers and technicians**

The legal duties of an employee include:

- taking reasonable care for your own health and safety and that of others who may be affected by what you do or do not do;
- co-operating with your employer on health and safety;
- correctly using work items provided by your employer, including personal protective equipment, in accordance with training or instructions; and
- not interfering with or misusing anything provided for your health, safety or welfare.

Underpinning these duties is the neighbour concept - treating others as you would treat yourself. This ethical principle underlies common and criminal law, the latter in the form of the Health and Safety at Work etc Act.

### **Provision of work equipment**

The safest form of radioactive materials is the *sealed source*, so called because the radioactive material is securely encapsulated to prevent it being released and

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<sup>1</sup> Physics teachers should have this knowledge because it is in the physics syllabuses.

contaminating the work place. Under the Schools Exemption Order to the Radioactive Substances Act, schools are permitted to hold a limited number of sealed sources provided that the activity of any single source does not exceed 370 kBq. This limit on activity ensures that no one working with a source could be at risk of harm because any likely dose would be insignificant. It also facilitates the source's disposal at the end of its working life.

Schools were equipped with a set of three or more sealed sources 40 years ago. These old sources were disposed of under the Government's Surplus Source Disposal Project (2007). Under the Ionising Radiations Regulations, any school re-stocking with new radioactive sources must do so in the form of a sealed source. Schools must not attempt to show radioactivity with geological specimens because lumps of rock can be highly radioactive and contaminate the work place.

### **Maintaining work equipment**

Sealed sources must be tested for leakage at least every 2 years.

### **Receiving hospitals**

One of the rules set by the Scottish Government's Education Directive is that each school must have the name and telephone number of a hospital for providing advice in the event of an accident. The major receiving hospitals for radiation casualties in the various areas of Scotland are shown below (table 2). The name of the hospital most convenient to your school should be inserted on your poster 'Safety arrangements: working with radioactive sources: what you should know and do'. Please note that unless you are responding to a radiation incident there is no need to contact the hospital because that would just create unwanted correspondence.

<b>Area</b>	<b>Major Receiving Hospital for Radiation Casualties</b>
Grampian	Aberdeen Royal Infirmary
Highland	Raigmore Hospital, Inverness
Lothian and Fife	Royal Infirmary, Edinburgh
Tayside	Ninewells Hospital, Dundee
West of Scotland	Royal Infirmary, Glasgow (adults) Southern General, Glasgow (adults) Royal Hospital for Sick Children, Glasgow (children) Crosshouse Hospital, Kilmarnock Dumfries and Galloway Royal Infirmary Royal Alexandra Hospital, Paisley Monklands Hospital

**Table 2** Major receiving hospitals for radiation casualties.

## **Training**

At least one teacher (the RPS) in every school must have training in radiological protection. Moreover, because every physics teacher needs to know about radioactivity, all physics teachers should be trained. It can also be helpful to provide training to one technician per school because technicians also need to know about radioactivity.

The scope of the SSERC training course covers radiological protection, safety management of work with radioactive materials and the properties of ionising radiations and radioactive sources.

## **Movement of sources**

If sources need to be moved to another site, use a carrier who specialises in transporting radioactive materials. Please ask your RPA for help in planning what to do before the refurbishment or rebuilding starts.

## **Further information**

The following documents can be downloaded from the SSERC website at [www.sserc.org.uk](http://www.sserc.org.uk)

<b>Ionising radiations</b>			
<b>Management arrangements</b>			
SSERC	2008	<a href="#">Working with radioactivity: what you should know and do</a> (Word file, 31K; updated August 2008)	Poster
SSERC	2008	<a href="#">Working with radioactive substances: record and management list</a> (Word file, 103K; updated August 2008)	Pro forma
SSERC	2008	<a href="#">Contingency plans</a> (Word file, 118K; updated August 2008)	Planning for unusual occurrences
SSERC	2008	<a href="#">Guidance for Council managers and non-physics heads of science</a> (Word file, 104K; updated August 2008)	Management of work with radioactive sources in schools
SSERC	2007	<a href="#">Expectant or breastfeeding mothers working with radioactive materials</a> (Word file, 28K) NEW	Health and safety guidance for expectant or breastfeeding mothers working with radioactive sources.
SSERC	2008	<a href="#">Justification, HSE notification, prior risk assessment and SEED approval</a> (Word file, 53K; updated August 2008)	Preliminary arrangements before work can commence with radioactive materials.
<b>Record keeping and storage</b>			
SSERC	2008	<a href="#">Keeping your radioactive sources safe during school refurbishments</a> (article from SSERC Bulletin 225, Summer 2008)	
SSERC	2008	<a href="#">Radioactive source storage</a> (Word file, 84K; updated August 2008)	
SSERC	2006	<a href="#">Security of radioactive holdings</a> (Word file, 56; updated August 2008)	An historical record is presented of losses of radioactive materials from schools.
SSERC	2008	<a href="#">Logbook of source use</a> (Word file, 70K; updated August 2008)	Logbook for recording withdrawals of sources from the store and stock checks.

<b>Risk Assessments</b>			
SSERC	2003	<a href="#">Risk assessment: use in schools of sealed radioactive sources made by Amersham</a>	
SSERC	2007	<a href="#">Prior risk assessment</a> - new (July 2007)	Prior risk assessment on the use of the Isotrak Cs-137/Ba-137m Isotope Generator in half-life experiments.
SSERC	2007	<a href="#">Half-value thickness demo. with gamma radiation and lead absorbers</a> (Word file, 542K - new) <a href="#">Inverse square law demo. with gamma radiation</a> (Word file, 443K; new)	Risk Assessments: Gamma half-value thickness demonstration Gamma inverse-square law demonstration
SSERC	2007	<a href="#">Radioactive minerals risk assessment</a>	Based on a set of 4 minerals: gummite, betafite, uranpyrochlore and pitchblende.
<b>Leak Testing</b>			
SSERC	2008	<a href="#">How to test the eluate of a Cs-137/Ba-137m Isotope Generator for Cs-137</a> (Word file, 124K; updated October 2008)	The leak test monitors the eluate for signs of a Cs-137 bleedthrough.
SSERC	2008	<a href="#">Protocol on the ageing and leak testing of sealed radioactive sources</a> (Word file, 91K; updated August 2008)	Includes leak test methods
SSERC	2007	<a href="#">Leak test analysis</a> (Excel file, 21K; updated June 2007) Experimental method described in <a href="#">Protocol on the ageing and leak testing of sealed radioactive sources</a>	Spreadsheet devised by SSERC to analyse radioactive source leak test results
<b>Transportation</b>			
SSERC	2007	<a href="#">Transport document</a> - new (July 2007)	A pro forma which, when completed, should be packed with any consignment of radioactive materials being transported by road.

SSERC	2007	<a href="#">Packaging and transporting of radioactive material by road</a> (RTF file, 72K - new)	Guidance covers the range of materials and articles commonly found in schools and relates to eventualities such as the disposal of sources, or the transferral of sources to new premises, or to another school, or Council premises.
<b>Disposal</b>			
SSERC	2007	<a href="#">Disposal routes by source category</a> (Excel file, 35K- new)	Legal conditions for keeping radioactive materials and disposing of waste.
SSERC	2007	<a href="#">Disposal recommendations</a> issued to councils, Aug. 2007 (Word file, 52K - new)	Recommendations on what to keep or dispose of.
SSERC	2007	<a href="#">Dustbin disposals</a> (Word file, 40K - new)	Legal conditions for disposal of waste to dustbins.
SSERC	2007	<a href="#">Disposal FAQs</a> (Word file, 53K - new)	Frequently asked questions about disposal.
SSERC	2006	A sourcespotter's guide to radioactive materials ( <a href="#">Word version</a> , 13Mb), ( <a href="#">PDF version</a> , 2Mb)	Catalogue and classification of radioactive sources.
<b>Bulletin articles</b>			
SSERC	2002	B207: <a href="#">Health effects of low-level radiation</a>	Up-to-date scientific advice on radiological risk and protection
SSERC	2007	<a href="#">Radioactive sources in schools</a> (article from SSERC Bulletin 221 - new July 2007)	Update report on the survey to find out exactly what radioactive materials were being held by schools.

<b>Miscellaneous</b>			
SSERC	2008	<a href="#">Gamma sources and standard school experiments</a> (article from SSERC Bulletin 223, <a href="#">Word file</a> , 4Mb)	Comparison of Cs-137 with Co-60
SSERC	2004	<a href="#">Radiological protection in schools: training needs</a>	Guidance for councils
SSERC	2006	<a href="#">Dose quantities</a> (Word file, 49K)	An historical account of dosimetric quantities and ICRP's 2005 recommendations of relevance to the physics syllabuses.
SSERC	2008	<a href="#">Recommendations on what sources to buy</a> (Word file, 115K - updated August 2008)	Sources on the educational market include sealed sources and isotope generators for half-life demonstrations.
<b>Obsolescent</b>			
SSERC	1987	Explanatory notes on local rules	Obsolescent - Contains a lot of good science on dose estimates and radiological protection
SEED	1988	Circular 1166: Procedures for the use of ionising radiations in educational establishments	Obsolescent Scottish Government Education Directive circular.