# Management of Closed Radioactive Sources

A Closed Radioactive Source is a discrete source, i.e. a physically entire source that performs a specific function and is not progressively consumed over time, as distinct to an Open Source, such as a radioactively labelled chemical, that is a consumable material. Examples of Closed Sources include:

- An instrument calibration source, for example for a liquid scintillation counter or gamma camera,
- A component of a detection system, for example an electron capture device in the detector of a gas chromatograph,
- A source used for irradiating or activating other materials,
- A source used for eliminating static,
- A measuring device such as for moisture, density or position.

The acquisition, use and disposal of closed sources is subject to regulation through licences (Registration Certificates) in the case of larger sources or through conditions attached to exemption from the licensing requirements in the case of smaller sources. The Environment Agency is the statutory body with responsibility for monitoring compliance with these requirements.

All closed sources must be:

- Recorded onto site and their location kept up to date,
- Kept secure and under the supervision of a designated person,
- Regularly checked and recorded, and
- Disposed of in accordance with the relevant statutory conditions.

The Safety Office has responsibility for ensuring that the appropriate conditions are met.

The Radiation Protection Supervisor is responsible for

- ensuring that the Safety Office is notified in advance of proposals to acquire, relocate, decommission or dispose of a source,
- confirming that sources are correctly accounted for,
- prompt notification to the Safety Office of any problems relating to the source,
- describing the nature and frequency of accounting checks for the sources in the local rules,
- notifying Safety Office of any changes in the identity of the Source Supervisors.

A Source Supervisor, who may be the Radiation Protection Supervisor, must be appointed for each source. This person will be responsible for the relevant security and accounting checks specified in section 2 and for bringing to the attention of the RPS in advance any changes that might affect the source or the arrangements for managing it. The Source Supervisor will be a suitable member of staff who is in a position to perform these duties and has received instruction in them.

## 1. Acquisition of a Closed Radioactive Source

All intended purchases of closed radioactive sources, whether as a stand-alone source or embedded within an item of equipment must be notified to the relevant Radiation Protection Supervisor and the Safety Office before purchase. The Safety Office will determine whether the nature and purpose of the source is such that an application to the Environment Agency to modify the Registration Certificate will be required before the source is brought on site. Should it be necessary to apply for such a modification, then the resulting Environment Agency fees will be charged to the School.

The Safety Office will also assess the suitability of the location, the radiation protection requirements and the security and accounting arrangements for the source.

**The source may only be brought onto site once the Safety Office has issued written approval.**

The installer of equipment that emits ionising radiation is required to carry out a critical examination to ensure that the safety features are working effectively and that dose rates are within design specification, i.e. that external exposure is adequately controlled. In the case of new equipment this is the responsibility of the supplier of the equipment. Should it subsequently be relocated a further survey will be required. Unless relocation is carried out by the supplier or their agent this must be arranged with the Safety Office.

Pre-acquisition notification for a new closed source or an item of equipment containing a closed source must be submitted to the Safety Office on Form Rad 2.

## 2. Keeping and Use of Closed Radioactive Sources - Security and Accounting Arrangements.

The Safety Office and the relevant RPS must be notified immediately of the delivery of a closed source. The Safety Office will issue a University source number which should be marked on the source, the source container or the body of the equipment as appropriate. [N.B. All sources and equipment containing sources should have been labelled by the manufacturer to indicate the radiation hazard (trefoil and source details).]

The details of the source will be included into the University Register of Closed Sources that is maintained by the Safety Office. A photograph of the most accessible and mobile element, i.e. the source, its container, or the item of equipment containing it will also be taken. The nature and frequency of source checks will be specified and a reference radiation level for the source established where possible and safe to do so.

All radioactive sources must be kept secure to prevent loss or theft. The laboratory or laboratory suite, workshop or storeroom must be secure. Access must be physically restricted to authorised persons.

In addition to the above the following measures, according to the nature of the source and its use, are also required.

**Mobile sources** - i.e. easily movable, not embedded within equipment (e.g. calibration sources). Access must be restricted to authorised personnel. The sources must be kept in a locked cabinet, cupboard or drawer when not in use - they must not be left on the

bench. Sources that need to be kept in the equipment for it to be readily available for use, for example refrigerated unquenched standards for scintillation counters, may be kept in the equipment in which case this shall be designated as the storage location.

(i) In the case of sources that are only used occasionally the key to the source cabinet must be held by the source supervisor with a signed record made for its issue and return. This record must include the location where the source is to be used, the date and time of removal from store and the date and time of return to store. A list of sources is to be displayed inside the cabinet etc. as a reminder to users to check the presence of sources and report problems. The door or drawer front must be marked on the outside with a trefoil warning sign. The Source Supervisor shall carry out a monthly, recorded check to confirm the presence of the source(s).

(ii) In the case of regularly used sources requiring ready access, i.e. several times a week, perhaps by a number of laboratory workers, a logbook listing the sources shall be kept in a convenient place to the storage location. Users shall sign the logbook each time the source or equipment is used. The logbook should carry an instruction to users to inform the Source Supervisor immediately should a source be missing. The Source Supervisor shall carry out a weekly check also recorded in the logbook.

**Static Sources** - i.e. effectively immobile, embedded within equipment. These are considered to be relatively secure. The source supervisor must carry out a monthly recorded check to confirm the presence of the source where possible or otherwise the presence of the equipment. [The source is often inaccessible allowing neither visual confirmation of its presence nor detection with a radiation monitor. Where the equipment is in regular use correct functioning of it is evidence that the source is present.]

The Radiation Protection Supervisor shall perform an independent check of the sources every 3 months and send a quarterly return to the Safety Office to confirm their presence and that the regular local checks being completed.

The Safety Office will perform a 6-monthly check of sealed sources and corresponding local records.

## 3. Relocation of Sources or Changes to Storage Arrangements

The Radiation Protection Supervisor must be notified in advance of any intention to modify the arrangements for storing or using the sources, including their relocation. Typical circumstances include movement of a source or of an item of equipment containing a source to another laboratory, workshop or storeroom either permanently or temporarily, for example during a refurbishment.

The Radiation Protection Supervisor shall send notification to the Safety Office by E-mail specifying the sources affected, the present location, the proposed location and the security and accounting arrangements to be applied. The new location must provide an equivalent level of security, accounting and supervision to that at the established location.

Relocation must not occur until the Safety Office approval has been received by the RPS.

## 4. Disposal of Sources or Equipment Containing Radioactive Sources

The disposal of radioactive sources is strictly regulated. All disposals must be supervised by the Safety Office, which will agree arrangements for the disposal with the School. The relevant RPS must also be informed. The cost of disposal is to be borne by the School. All sources awaiting disposal must be kept secure with access restricted to the Source Supervisor, who shall check mobile sources on a monthly basis and static sources on a quarterly basis.

Where it is proposed to dispose of an item of equipment containing a radioactive source, the safety, security and accounting requirements for the source must be formally assessed prior to decommissioning or disposal of the equipment or removal of the source from it. No equipment containing a sealed radioactive source may be decommissioned or disposed of, or have its source removed, without formal approval from the Safety Office. Form Rad 4 must be used in all cases to arrange for a source to be decommissioned - see also the supplementary notes of guidance to the form.

Wherever possible sources must be removed by the Supplier's service engineer and disposed of by return to the supplier. The cost of this route is not a consideration in determining whether this should be adopted.

Written confirmation or a disposal certificate should be obtained from the company to which the source has been transferred for disposal. Copies of this are to be provided to the Safety Office and the relevant RPS.

## 5. Exceptional Procedures

Exceptional procedures are those that are not covered by the above arrangements. These might include the construction of equipment incorporating radioactive sources as well as its dismantling or modification, and novel uses of sources.

Exceptional procedures are prohibited without prior consultation with, and formal written approval by, the Safety Office. Approval may require the obtaining of independent advice of which there is written evidence.

In assessing whether to proceed the following should form a part of the considerations:

- The justification for the proposed activity,
- Is there someone with more experience reasonably available to carry out the task or advise on it (including from outside the University)?
- Does any part of the procedure rely on presumption and inference rather than direct evidence?
- A reasonable assessment of the risks from the proposed activity, including an estimate of dose and identification of measures to restrict exposure,
- All solid sources must have their presence positively confirmed. This might be by direct inspection, indirect confirmation with a radiation monitor or indirect confirmation by a physical reading taken on the equipment of which the source forms a part.

It should also be noted that the construction or modification of equipment using ionising radiations will usually involve a Critical Examination (Ionising Radiations Regulations 1999, Regulation 31(2)) involving a Radiation Protection Advisor.

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Link to Form Rad 2 (in Word format)
Link to Form Rad 4 (in Word format)

Request to Decommission Equipment Containing a Radioactive Source - Supplementary Notes of Guidance to Form Rad 4.

- Approval must be obtained from the Safety Office before any equipment containing a radioactive source is decommissioned.
- This must be obtained by completing Form Rad 4.
- The form, with approval confirmed by the University Safety Officer, must be received before the equipment is decommissioned.

The acquisition and disposal of radioactive sources is strictly regulated. This procedure is to ensure that the safety, security and accounting requirements for the source are formally assessed prior to decommissioning or disposal of the equipment or removal of the source from it.

No equipment containing a sealed radioactive source may be decommissioned or disposed of, or have its source removed, without formal approval from the Safety Office. Examples of relevant sources include calibration sources for liquid scintillation counters or as part of a detection system. The following procedure **must** be followed in **all** cases.

Wherever possible sources must be removed by the service engineer and disposed of by return to the supplier. The cost of this route is not a consideration in determining this.

Where it is not possible to arrange for disposal through the above method the source may only be removed by someone who is suitably competent, i.e. having sufficient knowledge and experience of the type of equipment and of working with radioactive sources, **and** in the presence of an appropriate person from the Safety Office. Account must also be taken of the availability of clear information from the manufacturer concerning source removal. If necessary further information may need to be obtained.

Development of the removal procedure includes identifying: -

-the potential for radiation exposure and the measures necessary to minimise this, and
-the means for verifying that the source has been removed, for example visual or functional check, or confirmation with a radiation monitor.

Form Rad 4 must be completed whether the source is to be removed by a service engineer or in-house. It must be countersigned by the Radiation Protection Supervisor and submitted to the Safety Office. Work must not be done until this form, formally

approval by the University Safety Officer, has been returned to the RPS.

The Safety Office may specify additional requirements. These might arise from an on-site assessment by an appropriate person from the Safety Office, usually the Technician, and by reference to manufacturer’s documentation and further reference to the supplier/manufacturer.

After the work has been completed the Confirmation Report section on the "approved" form must be completed and returned to the Safety Office.