



University of
St Andrews

Risk Assessment No 3 - Risk Assessment for the Use of Low Activity Sealed Sources under the Ionising Radiations Regulations 2017

Ionising Radiations Regulations 2017

Document type	Procedure
Scope (applies to)	Staff and students
Applicability date	11/07/2021
Review / Expiry date	12/07/2024
Approved date	12/07/2021
Approver	Head of EHSS
Document owner	Deputy Director
School / unit	Environmental Health and Safety Services
Document status	Published
Information classification	Public
Equality impact assessment	None
Key terms	Health and safety/Hazard identification and risk assessment
Purpose	Compliance with Ionising Radiations Regulations 2017 legislation

RISK ASSESSMENT 3 - Use of Low Activity Sealed Sources – IRR17
Description of Work and Scope of the Assessment
<p>This is a risk assessment for the use of low activity radioactive sources (Sr-90, Co-60), calibration sources within equipment and other items (eg Uranium Glass Block) of less than 185kBq</p> <p>This risk assessment has been carried out in accordance with the Ionising Radiations Regulations 2017 (IRR17) Approved Code of Practice (ACoP). This risk assessment only addresses the radiological risks associated with the type of equipment detailed above.</p>
Who is at risk?
<p>These are all low activity sources. All sources are used for undergraduate research or are imbedded in equipment.</p> <p>The risk is very minor due to the low activity. Suitable shielding (lead glass screen for Co-60 but perspex for Sr-90) will be used.</p> <p>Calibration sources will be located within equipment and should be suitably shielded such that no person should be exposed to radiation except for maintenance.</p> <p>Nobody else should be exposed to these sources</p>
<u>ACoP Paragraph 70 - Matters to be considered in an assessment, where relevant</u>
70(a) - Nature of the radiation sources likely to be present
<p>The Co-60 source will produce mainly gamma radiation while the Sr-90 sources will produce almost 100% beta emissions</p> <p>Other sources may be incorporated into equipment as calibration sources</p>
70(b) - Estimated dose rates
<p>No dose recorded on whole body dosimeters of greater than 0.5 mSv/2 months</p>
70(c) - Likelihood of contamination arising and being spread
<p>The there is no likelihood for contamination under normal use. Sealed sources are wipe tested on a 24 month cycle. No evidence of leakage from sealed sources.</p> <p>Sources in equipment will be fixed into the equipment and no University personnel will have access to these sources.</p>
70(d) - Results of previous personal dosimetry and area monitoring
<p>No dosimeter readings greater than 0.05 mSv/2 months for normal use of the equipment. Dose rates less than 2.5 µSv/hr thus below the IRR17 requirement for a 'Supervised Area'.</p>

70(e) - Advice from manufacturers or suppliers about safe use and maintenance of equipment
<p>Only authorised trained personnel will be allowed or closely supervised under graduates will be allowed to use these sources.</p> <p>Sources in equipment will not be accessible and will be well shielded.</p>
70(f) - Engineering Controls, etc. In place or planned
<p>The sources are kept within a locked room and then inside a locked safe. Access to the sources is restricted to named individuals.</p> <p>The sources are enclosed inside a specific holder which is then held onto a holder. The sealed source is never exposed.</p> <p>Calibration sources within equipment cannot be accessed except by maintenance engineers from specialist company. Any work on equipment sources would require the room to be transferred to the control of the maintenance company while work on such sources is undertaken.</p>
70(g) - Planned Systems of Work
<p>Only trained users who have passed the test on the University Radiation Protection Course are allowed to use the equipment. Undergraduates are then allowed to use these in experiments under close supervision</p> <p>Access to calibration sources within equipment will only be allowed to trained maintenance engineers from specialist companies. When such sources are exposed, the responsibility of the room will be temporarily transferred to the maintenance company</p>
70(h) - Estimated airborne and surface contamination levels
<p>Surface contamination levels ie leakage of radioactive is regularly measured. No such leakage has occurred.</p>
70(i) - Effectiveness and suitability of PPE
<p>Laboratory coat, disposable nitrile gloves and eye protection should be worn</p>
70(j) - Unrestricted access to high dose rates or significant contamination
<p>No high dose levels will be present</p>

70(k) - Possible accident situations, their likelihood and severity

- The source leaks out of its support medium. This is checked for during leakage tests

Foreseeable Sealed Source Incident	Actions to be taken
Theft or loss of source	The URPO should be notified as soon as is reasonably practicable. A search will be instigated to try and locate the relevant sources. If the sources cannot be found, the URPO will notify Police Scotland, SEPA and HSE
Terrorist Action	If there is evidence of a terrorist action against the HASS source, then the Head of University Security must be informed who will notify Police Scotland with the Head of EHSS and URPO
Failure of Shielding	If during use or an inspection a significant dose is detected outside the shielding of the equipment HASS or other sources with a high activity, then the equipment must be taken out of service and the room locked. The URPO and the University RPA must be told of this who will take the appropriate actions
Leakage from the Sealed Source	If during the annual wipe test of sealed sources it is determined that the sealed source is leaking from its protective cover, then the sources made safe where this is possible and the room must be locked. The URPO must be notified as soon as practicable who will arrange for disposal of the source.
Fire	In the event of a fire in a room with sealed sources, evacuate the room (helping any injured person out of the room), activate the fire alarm to evacuate the building. Call the Fire Service on 999 or 112 and tell them there is a fire and that the fire is in a room with radioactive materials. Wait for the fire service to arrive and then give details of the incident. Notify the URPO and DRPS and Head of School about the fire as soon as possible.
Flood	If the flood can be easily stopped, it should be. If there is a flood in a room with sealed radioactive sources, evacuate the room. Notify the URPO, DRPS and Building Safety Co-ordinator during normal working hours. Call Security and Response if out of hours.

70(l) - Consequences of failure of Control Measures including Systems of Work
See Table 1
70(m) - Steps taken to prevent accidents, or limit their consequences
See Table 1.

TABLE 1

Step	Who is Affected	Hazard		Initial Risk			Controls	Residual Risk		
		Description	Effect	SF	FF	R	List of Controls Required	SF	FF	R
1	Worker	The users are exposed to unshielded radiation	Possibility of raising risk of some form of cancer.	2	2	4	These sources are all very low activity sources and present minimal risks. All sources will be worked on behind suitable shielding. All workers will be wearing laboratory coats, disposable nitrile gloves and eye protection as standard laboratory PPE	2	1	2
2	Workers and DRPS (or depute) and URPO	If the sealed radioactive leaks	Possible risks of cancer	3	2	6	If the dose rate meter/contamination meter shows there is leakage of radioactive materials, then it will be removed from service - taken to the University radioactive waste store for disposal	2	1	2
3	Trades staff (eg Plumbers) who need access to specific areas	There may be a requirement for plumbers (for example) who need access to this area	Possible risk of cancer	4	2	8	No trades staff may enter this room without approval of DRPS. The area will be monitored before trades staff enter the area and a whole body radiation dosimeter will be issued to the trades staff to ensure they have not received a dose	2	1	2
4	Administrative Staff	No administrative staff will be allowed into this area	No administrative staff	1	1	1	Signage on the door will say Only Authorised personnel can enter	1	1	1
5	Cleaners	No cleaners will be allowed into this area without approval	No cleaners allowed in at any time	1	1	1	Signage on the door will say Only Authorised personnel can enter.	1	1	1

Matrix of Risk Level						
Severity Factor (SF)						
Frequency Factor (FF)	Frequency Factor		Slightly Harmful (1)	Harmful (2)	Very Harmful (3)	Extremely Harmful (4)
		Very Unlikely (1)	1	2	3	4
		Unlikely (2)	2	4	6	8
		Possible (3)	3	6	9	12
		Probable (4)	4	8	12	16
Risk (R) = Frequency factor (FF) x Severity of Harm (SF)						
Risk Rating (R)	Classification	Action Required				
1-2	Low	No additional controls				
3-4	Acceptable	Consider additional controls				
6-9	Moderate	Additional controls to be made				
12-16	High	Task must not be completed. Look for alternative method				

ACoP Paragraph 71 – Outcomes of the assessment

71(a) - Actions taken to keep exposures ALARP

All work will be risk assessed. Where it is possible to use non-radioactive systems these will be used. If the work must use irradiator then a detailed assessment will be undertaken.

Only trained personnel will be allowed to undertake this work. Access to this room is via key lock.

There will be no unauthorised personnel in this area.

All work will be undertaken behind appropriate shielding Co-60 sources will be worked on behind lead glass shielding and Sr-90 behind Perspex shielding

PPE - all workers will wear a laboratory coat, disposable nitrile gloves and eye protection.

Only maintenance engineers from specialist companies will have access to calibration sources within equipment

71(b) - What Engineering Controls, Warning Signals and other Safety Systems are necessary

The door to the room will have a no unauthorised entry signage posted on the door

71(c) - Whether PPE is appropriate and if so what type

Laboratory coat, disposable nitrile gloves and eye protection - Standard laboratory PPE.

71(d) - Dose Constraints

We have adopted the safe working threshold as less than 0.5 mSv/2months.

71(e) - Protection of female employees

No additional protection required. A separate risk assessment should be undertaken for expectant mothers.

71(f) - Investigation levels

An investigation action level of 0.5 mSv/2months has been adopted.

71(g) - Maintenance and testing schedules

There is regular leak testing of the sources.

71(h) - Contingency Plans

Foreseeable Sealed Source Incident	Actions to be taken
Theft or loss of source	The URPO should be notified as soon as is reasonably practicable. A search will be instigated to try and locate the relevant sources. If the sources cannot be found, the URPO will notify Police Scotland, SEPA and HSE
Terrorist Action	If there is evidence of a terrorist action against the HASS source, then the Head of University Security must be informed who will notify Police Scotland with the Head of EHSS and URPO
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71(i) - Training needs

All users of the sources have been trained on the University Radiation Protection Electronic programme and have passed the associated test with greater than 60%. Under graduates will use the sources under close supervision. Records of such training are held on the University of St Andrews Moodle Training Platform.

71(j) - Designation of Controlled and Supervised Areas

No dose rates greater than 2.5 $\mu\text{Sv/hr}$ would be expected in the room thus would be below the IRR17 requirement for a 'Supervised Area'.

Areas are deemed as Supervised Area as long as the following parameters are met:

STORAGE		USAGE	
Radionuclide	Supervised Area (MBq)	Supervised Area (MBq)	Teaching Laborator (MBq)
3H	1000	100	20
14C	500	50	10
22Na	50	5	1
24Na	50	5	1
32P	50	5	1
35S	500	50	10
36Cl	50	5	1
45Ca	50	5	1
51Cr	500	50	10
59Fe	50	5	1
86Rb	50	5	1
125I	10	5	0.1

Any amounts which exceed this will be deemed a 'Controlled Area'.

71(k) - Access restrictions and other precautions for designated areas

Access to the area where the sources are stored is via a locked door and then via a locked safe.

71(l) - Designation of persons

Not required.

71(m) - Personal dosimetry
Whole body dosimeter badges issued when such work is undertaken
71(n) - Leak testing of radioactive sources
There will be leak tests done on the Sr-90 and Co-60 sources every 24 months
71(o) - Responsibilities of managers
Ensure that Local Rules are followed, and all staff are properly trained.
71(p) – Monitoring / auditing program to ensure compliance with IRR77
RPA to audit operations every two years

Lead Assessor (sign):



Assessor

Dr Paul Szawlowski, University Radiation
Protection Officer and Deputy
Director of Environmental, Health
and Safety Services

Date of Assessment:

12/07/2021

Appendix 1

RADIATION CONTROLLED AREA AND EQUIPMENT HANDOVER FORM

Part 1: School/unit – Handover of Controlled Area and Equipment to Company Representative			
SITE:		CONTROLLED AREA / ROOM:	
COMPANY CARRYING OUT WORK:			
REASON FOR HANDOVER:			
IDENTIFY KNOWN HAZARDS WITH CONTROLLED ARE OR EQUIPMENT:			
As an authorised representative of the School/Unit I hereby hand over the controlled area and equipment as above. Information has been exchanged to enable appropriate risk assessment to be made.		Company: As an authorised, and suitably trained, representative of the company, I accept responsibility for the controlled area and equipment. I will work in compliance with my employer's procedures and Local Rules.	
School/Unit Representative:	Signature:	Company Representative:	Signature:
Date:	Time:	Date:	Time:
Part 2: COMPANY REPRESENTATIVE – Handover of Controlled Area and Equipment to School/Unit			
Please tick all applicable categories of work carried out. See visit / service report for full details.			
Category of Work		Details	
<input type="checkbox"/> Routine Service			
<input type="checkbox"/> Fault Diagnosis / Repair			
<input type="checkbox"/> Installation of Part(s)			
<input type="checkbox"/> Upgrade / Modification		<input type="checkbox"/> Hardware / <input type="checkbox"/> Software	
<input type="checkbox"/> Incident Response			
<input type="checkbox"/> RPA Inspection			
<input type="checkbox"/> Exposure Protocol Changes			
<input type="checkbox"/> Other			
Could this work have implications for radiation safety of image quality?			<input type="checkbox"/> NO / <input type="checkbox"/> YES
If “Yes”, tick one or more boxes below that apply. Please refer to the visit / service report for full details.			
<input type="checkbox"/> Shielding	<input type="checkbox"/> Interlocks / Exposure termination	<input type="checkbox"/> Safety features / warning devices	
<input type="checkbox"/> Beam quality / filtration / grid	<input type="checkbox"/> Collimation / alignment / field sizes	<input type="checkbox"/> Detector dose / input dose	
<input type="checkbox"/> 1. Equipment is OPERATIONAL following work as indicated above and detailed on the visit / service report.			
<input type="checkbox"/> 2. Equipment is PARTIALLY OPERATIONAL , but limitations may exist, please refer to visit / service report.			
<input type="checkbox"/> 3. Equipment is NOT OPERATIONAL and MUST NOT BE USED .			
Part 3: School/Unit – Returning Equipment to Use			
I confirm that I have been authorised as a competent practice representative <input type="checkbox"/>			
I confirm that the above Company has provided information and that I have reviewed the associated service report (if applicable) and appropriate checks have been carried out in accordance with my employer's procedures <input type="checkbox"/>			
<input type="checkbox"/> 1. I am satisfied that the equipment is in a satisfactory condition for use.			
<input type="checkbox"/> 2. I am NOT satisfied that the equipment is satisfactory for use. Reason: Actions taken:			

School/Unit Representative:	Signature:	Company Representative:	Signature:
Date:	Time:	Date:	Time:

Version number	Purpose / changes	Document status	Author of changes, role and school / unit	Date
v1.0	New Document	Approved	Dr Paul Szawlowski	12/07/2021