



University of
St Andrews

Risk Assessment No 2 - Risk Assessment for the Consent for Industrial Irradiation 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 Number 2 - Consent for Industrial Irradiation – IRR17

Description of Work and Scope of the Assessment

This is for the deliberate irradiation of specimens using an Irradiator machine with an internal shielded 63TBq Cs-137 source

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.

Who is at risk?

Nobody should be at risk as the source is shielded by extensive lead shielding. The only person within the room would be workers and DRPSs.

No unauthorised persons allowed in the room with the irradiator.

Maintenance of the equipment is undertaken by an engineer from a specialised company. The room where the equipment is would be transferred to the control of the maintenance company and no University staff would enter the room unless specifically requested by the engineer.

ACoP Paragraph 70 - Matters to be considered in an assessment, where relevant

70(a) - Nature of the radiation sources likely to be present

The Cs-137 source produces gamma radiation. There should be no irradiation outside the equipment.

70(b) - Estimated dose rates

Dose rate at the unshielded source is 2.4 Gy/min. No dose rate above 2.5 μ Sv/h measured on surface of irradiator

70(c) - Likelihood of contamination arising and being spread

The there is no likelihood for contamination under normal use

70(d) - Results of previous personal dosimetry and area monitoring

No dosimeter readings greater than 0.05 mSv/2 months for normal use of the equipment. Dose rates less than 2.5 μ Sv/h on surface thus below the IRR17 requirement for a 'Supervised Area'. Dose rate meter available to check dose rates when machine in operation

70(e) - Advice from manufacturers or suppliers about safe use and maintenance of equipment

Only authorised trained personnel will be allowed into the area where this work is undertaken. All users must wear a whole body dosimeter badge when entering this area . Irradiator serviced every year and wipe test of source carried out by service engineer.

70(f) - Engineering Controls, etc. In place or planned

There is a three point control of access to the source. The door from the corridor has a door lock. Access to the inner ante room is via a key swipe with only authorised users allowed to access it. Inside the ante-room access to the irradiator is via a swipe card, PIN control for alarm deactivation, and door lock. Only users have access to the room.

All users of the facility have been trained on the University Radiation Protection Electronic programme and have passed the associated test with greater than 60%.

There are safety mechanisms to ensure that when the samples are mechanically moved into the chamber where the sealed 63TBq Cs-137 source is located such that shielding covers the entry mechanism so that workers do not receive a dose. No users will be able to have access to the source directly and thus cannot be exposed to the radiation from the source

Mechanisms are regularly checked by an outside contractor (RPS). There will be a special 'Safe System of Work' produced by the external contractor when they come in to undertake maintenance. No University staff will be allowed into the room, while the irradiator is serviced.

70(g) - Planned Systems of Work

Only trained users who have passed the test on the University Radiation Protection Course are allowed into this area.

Access is via a three point access control system.

There is no access to the source directly only through the irradiator mechanism.

Maintenance of the equipment is undertaken by an external contractor who will produce their own 'Safe System of Work' and risk assessments which will be attached to this document.

70(h) - Estimated airborne and surface contamination levels

Surface contamination levels are measured using a contamination monitor with a thin end window Geiger tube.

The background levels are approximately 0.1 μ Sv/hr when the irradiator is in use there are no dose rates above background.

Any levels above background would require work to stop and local DRPS and URPO contacted. The equipment will be immediately taken out of service and an external contractor requested to investigate

70(i) - Effectiveness and suitability of PPE

Laboratory coat, disposable nitrile gloves and eye protection should be worn as standard laboratory PPE.

70(j) - Unrestricted access to high dose rates or significant contamination

Not allowed to anyone.

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

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	A significant dose is measured during the operation of the equipment	Possibility of raising risk of some form of cancer.	4	2	8	<p>This is a high activity source and thus if there is a significant dose the risk of a significant injury. Controls would be:</p> <ul style="list-style-type: none"> Regular maintenance of the equipment by a specialist external contractor Dose rate meter checks to ensure there is no external dose from the equipment. <p>If the equipment fails such that there is a significant dose at the surface of the equipment, the area will be evacuated immediately and the DRPS and URPO notified immediately. The area will be locked such that nobody else can enter the area. Any other areas affected which are receiving a radiation dose will also be evacuated. A specialist external contractor will be requested to attend and fix the equipment. Specialist external contractor will produce their own 'Safe System of Work' and risk assessment for the repair work</p>	2	1	2

2	Workers and DRPS (or depute) and URPO	If the sealed radioactive Cs137 source leaks	Possible risks of cancer	4	2	8	If the dose rate meter shows there is contamination of the container for taking samples into the irradiator, the containers and samples will be left in the room. The room will be immediately evacuated and the door lock and nobody will be allowed in. The local DRPS and URPO will be notified immediately who will ensure that the locks to the door are changed to stop anybody else entering the area. A specialist external contractor will be requested to attend and fix the equipment. Specialist external contractor will produce their own 'Safe System of Work' and risk assessment for the repair work	2	1	3
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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	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	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.

All work will be undertaken in the room where the irradiator is located.

Only trained personnel will be allowed to undertake this work. Access to this room is via electronic locking systems and a PIN code

There will be no unauthorised personnel in this area.

All work will be undertaken behind appropriate shielding The samples will be located in containers which are then mechanically moved into the irradiator and shielding covering as the sample is loaded. The source will be shielded with lead at all times

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

Sample containers will be checked prior to entry into the irradiator and after use with a dose rate meter

As a measure of exposure, all users will wear radiation whole body dosimeter badges to ensure that they have not accidentally been exposed to a significant radiation dose

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

The door to the irradiator room will say 'Only Authorised Entry'. Access to irradiator room is via door lock, security alarm, swipe card and a PIN control access. Only users will be allowed into this area and approved by the School of Medicine.

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

Laboratory coat, disposable nitrile gloves and eye protection.

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 specialised risk assessment will be undertaken for each expectant mother who wishes to continue working with the irradiator

71(f) - Investigation levels

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

71(g) - Maintenance and testing schedules

There an annual service and testing of the irradiator

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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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.
71(l) - Designation of persons	
Not required. There should be no surface dose rate on the irradiator	
71(m) - Personal dosimetry	
Whole body dosimeter badges issued to workers.	

71(n) - Leak testing of radioactive sources

There will be leak tests done on the 63TBq source by a specialised external company. Risk assessments and 'Safe Systems of Work' for this will be produced by the company and attached to this document. The responsibility for the irradiator room will be passed onto the maintenance company when such work is undertaken (see attached form in Appendix 1. No University staff will be allowed in the irradiator room when this process is being undertaken unless authorised by the maintenance company. The specialist external company will produce their own risk assessment and 'Safe System of Work' for their own staff.

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):

A handwritten signature in blue ink, appearing to be 'P. Szawlowski', written on a light blue background.

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 AREA 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:

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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