THE RADIATION PROTECTION NOTE 9: RISK ASSESSMENT

GENERAL

On 1 January 2018 Ionising Radiations Regulations 2017 (IRR17) replaced IRR99.
Under IRR17 there's a three-tier system of notification, registration and consent that replaces the IRR99 requirement for notification and prior authorisation;
You must apply before you start new work involving ionising radiation.

These work activities involve the use of electrical equipment intended to produce X-rays for the purpose of

(i) industrial radiography
(ii) the processing of products
(iii) research
(iv) the exposure of persons for medical treatment
(v) the use of accelerators, except electron microscopes.

Before commencing a new work activity involving ionising radiations, a risk assessment shall be made which identifies the hazards and evaluates the nature and magnitude of the risks to which both workers and members of the general public could be subjected.

It is normal practice in the University of Glasgow for all new work activities to be registered with the local Radiation Protection Supervisor and the Radiation Protection Adviser (RPA).

The risk assessment should be made as part of the work registration procedure by the RPA, local RPS or local supervisor depending upon individual circumstances. It is important to identify significant risks and the time and effort and detail of a risk assessment should be proportionate to the perceived risk. Activities handled, estimated dose-rates and the likelihood of contamination are all factors that will determine the designation of the area and this in itself will act as a guide in assessing the magnitude of the risks.

For example, in work involving unsealed sources, if it can be clearly demonstrated that likely worker doses are well below the general public limit, then there is little more to be done other than detailing standard working procedures for that type of work. In many cases simple generic assessments will be acceptable, but some may wish to involve the individual researcher in this process as a means of monitoring their competence in radiation safety.

Given the precautions taken to practice ALARP and the record of minimal radiation doses in research and teaching, the residual risks in most activities will be very small and the conclusions of the risk assessments should reflect this.

Different types of activity will involve different hazards and risks and therefore it is worthwhile considering them separately.

RISK ASSESSMENTS FOR WORK INVOLVING UNSEALED SOURCES

The person carrying out the risk assessment (Assessor) should be familiar with the properties of all the radionuclides which it is intended to use. The following are some of the other items, which will need to be considered:

- the quantities handled and the frequency of procedures
- the degree of any external hazard
- the degree of any air contamination hazard
- manufacturer's guidance relating the storage, dispensing and handling of the material
- the risks associated with different waste streams
- the grading and suitability of laboratory facilities
- the effectiveness of general procedures taken to restrict exposure ie, shielding, containment, monitoring, protective clothing.

RISK ASSESSMENTS FOR WORK INVOLVING SEALED SOURCES

The Assessor should be familiar with the sources to be used and the dose-rates associated with them. Normally, high activity sources should be housed in purpose-built equipment or facilities such that the dose-rate to which a worker would normally be exposed would be less than 7.5 $\mu Sv h^{-1}$ and usually less than 2.5 $\mu Sv h^{-1}$ if reasonably practicable. The Assessor will need to carry out a survey to establish that the dose-rates outside the equipment/facility are satisfactory.

Only those personnel involved in source changing are likely to be subjected to higher dose-rates and possibly a significant risk of exposure. The risk assessment should therefore concentrate on the operations which those personnel perform and an estimate of dose/operation should be recorded. (This may not be necessary if this work is contracted to a third party).

RISK ASSESSMENTS INVOLVING MACHINE SOURCES

When equipment is first installed, it is the responsibility of the installer to ensure that a critical examination is undertaken. This should ensure that all safety features and warning indicators are functioning correctly and that dose-rates associated with use of the equipment are within design specifications so that adequate protection is provided from ionising radiations for both staff and members of the public. The RPA should be consulted about the nature of the critical examination and he/she may wish to carry out a confirmatory survey and may also need to check that shielding, incorporated into the building fabric, is performing to expectations.

With X-ray crystallographic equipment there may be alignment procedures which require over-riding of some of the standard design safety features. These procedures should be restricted to named authorised personnel and carefully assessed. If practicable, additional mechanical items/engineering controls should be used for these procedures to minimise potential radiation dose. Where it is considered necessary to set up a controlled area during alignment, then specific written procedures will be required.

RISK ASSESSMENTS AND EMERGENCY PROCEDURES

An important part of the risk assessment is to evaluate accident scenarios and consider the actions to be taken in emergency situations. Every laboratory should have at least simple emergency action plans with key information posted in the laboratory. All radiation workers should be made aware of the action to be taken in the event of an emergency situation.

Where the work involves the use of controlled areas and a radiation accident is reasonably foreseeable (eg, fire, spillages) then a more detailed contingency plan will be required. The contingency plan will need to be incorporated in the 'local rules'. Those employees affected will need to receive appropriate training in implementation of the contingency plan and rehearsals of the arrangements in the plan should be carried out as deemed necessary by the RPA.

RECORDING THE RESULTS OF THE RISK ASSESSMENTS

All risk assessments should be recorded but this does not mean duplication of existing procedures. It should already be standard practice to draw up guidelines in the form of a protocol, systems of work, work certificate or local rules for each project or use of a particular item of equipment. These guidelines should reflect the results of the risk assessment and form evidence of one being undertaken. They may need only minor modification to meet current regulatory requirements. All risk assessments should also be reviewed periodically and the results of such views recorded.

University of Glasgow

Risk Assessment – Ionising Radiations

Risk Assessment Number:
Description of work:

Source of ionising radiation	
Major emissions and their energies	
Nature of staff exposure risk	
Likely staff at risk	
Radiation employees annual dose limit(s)	Whole-body dose = 20 mSv Investigation level = 2 mSv Target level < 1 mSv
Physical half life, T_{phys}, of radioisotope	
Biological half life T_b	
T_{eff} of radioisotope (days)	
Dose rate calculations **External**	
Dose rate calculations **Internal**	
Internal routes of entry	
Open bench?	

Estimated dose-rate to hands per experiment for unshielded source. **Beta exposure**	
Estimated Bremsstrahlung from shielding	
Estimated external dose-rates per experiment for unshielded source. **Gamma exposure**	
Shielding Requirements	
PPE requirements	
Dosimeter requirements	

Assessment of risk if all protocols, shielding and PPE applied	
Population odds from whole body annual exposure	

BERT from whole body annual exposure	

If the risk is medium or high, are there any ALARP measures that may be improved ie:

	Yes	No
Time		
Distance		
Shielding		

1	Is it possible to reduce the amount of radioactivity used?	Yes/No
2	Is additional training or supervision required?	Yes/No
3	Will it be necessary to "classify" the worker?	Yes/No
4	Should the worker work only in a 'controlled' radiation area?	Yes?No

ADDITIONAL CONTROLS

1	Are departmental contamination surveys carried out?	Yes/No
2	Are portable contamination monitors tested annually?	Yes/No
3	Are personal dosimeters required?	Yes/No
4	Have all measures been taken to ensure that radionuclides are stored safety and securely when not in use?	Yes/No

Date of assessment	
Signature	
Reviewed by	
Date	

Note 1 The Risk Assessor should normally be the laboratory supervisor but some departments prefer the Departmental Radiation Protection Supervisor to do carry out this task for consistency in risk assessments.

Note 2 Identify whether a COSHH risk assessment is also required.

Note 3 <u>Personnel who might be at risk:</u>

1 Registered radiation workers
2 Other non-radiation workers who share the same laboratory
3 Cleaners
4 Maintenance staff
5 Contractors
6 Visitors
7 Undergraduate students
8 Members of the general public
9 Others

SUMMARY

Risk assessment is a five step process:

1 Identify the potential hazards
2 Decide who might be harmed and how
3 Evaluate the risks and decide whether existing precautions are adequate
4 Record your findings (ie on this form)
5 Review the assessment periodically and revise if necessary.

Notes: This risk assessment should be read in conjunction with the appropriate System of Work