

PROCEDURES FOR DISPOSAL OF RADIOACTIVE WASTE

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1. PURPOSE

The purpose of these procedures is to ensure the correct packaging and disposal of radioactive waste by any staff member or student who generates radioactive waste whilst working or studying with radioactive material at Monash University, in accordance with the requirements of the Radiation Act 2005, Radiation Regulations 2007 and the Occupational Health and Safety Act 2004.

2. SCOPE

The guidance, procedures and processes outlined in this document apply to staff, students, visitors and contractors at the Australian campuses of Monash University and to Monash controlled entities.

3. ABBREVIATIONS

OH&S Occupational Health and Safety Branch
RSO Radiation Safety Officer
RPO Radiation Protection Officer

4. DEFINITIONS

4.1 CONTAMINATED LIQUID WASTE

Liquid radioactive waste (miscible or immiscible) that contains significant levels of chemical contamination.

4.2 HEAD OF ACADEMIC/ADMINISTRATIVE UNIT

Head of academic/administrative unit is used to denote the head of the area that is undertaking the activity. For academic areas, this term includes head of faculty, department, school, institute or centre. For administrative areas, the term includes head of division, branch, centre or unit.

4.3 IMMISCIBLE LIQUID WASTE

Liquid radioactive waste that is immiscible with water and therefore not able to go to the sewer at any activity or rate.

4.4 LOW LEVEL SOLID WASTE

Comprises solid items such as benchcote, gloves, pipettes and empty scintillation vials. Each package should contain one radionuclide, and the activity in each package must be less than;

Radioisotope	Activity in a single package less than
P-32	0.1 MBq
Na-22, I-125	1 MBq
C-14, Cr-51	10 MBq
P-33, S-35	100 MBq
H-3	1 GBq
Contact the RPO for information on disposal of other radionuclides	

4.5 MEDIUM TERM SOLID WASTE

Packages that contain more than the amounts in the table above cannot be disposed of to landfill immediately, and are designated medium term radioactive waste.

4.6 MISCIBLE LIQUID WASTE

Liquid radioactive waste that is miscible with water and therefore able to go to sewer.

4.7 OCCUPATIONAL EXPOSURE

Occupational exposure is exposure of a person to radiation that occurs in the course of that person's work or study.

4.8 PUTRESCIBLES WASTE

Putrescibles waste is solid waste that contains organic matter capable of being decomposed by microorganisms (e.g. carcasses, tissue samples).

4.9 RADIATION PROTECTION OFFICER

The Radiation Protection Officer is the OH&S staff member responsible for providing and coordinating radiation protection services at Monash University.

4.10 RADIATION SAFETY OFFICER

A radiation safety officer is a designated staff member in a unit responsible for approving and supervising the ionising radiation work and study of staff and students.

4.11 RADIATION WORKER

A radiation worker is a staff member or student who is exposed to ionising radiation as a result of working with ionising radiation source(s) as part of their work/study.

4.12 SHARPS WASTE

Sharps waste comprises objects that can pierce or penetrate the skin.

5. SPECIFIC RESPONSIBILITIES

A comprehensive list of OHS responsibilities is provided in the document *OHS management at Monash University: Structure, functions, roles and responsibilities* (www.adm.monash.edu.au/ohse/documents). A summary of responsibilities with respect to these procedures is provided below.

5.1 HEAD OF ACADEMIC/ADMINISTRATIVE UNIT

The head of academic/administrative unit is responsible for:

- ensuring compliance of the unit/entity with the radioactive waste disposal procedure;
- providing budgetary resources to cover the cost of the waste disposal for their unit/entity to be carried out by a government approved waste contractor.

5.2 RADIATION SAFETY OFFICER

The RSO is responsible for:

- providing advice on packaging and storage within their area;
- ensuring that all radiation workers correctly package and store radioactive waste as per guidelines;
- maintaining records of the number of bags, pails and sharps containers of each type of solid radioisotope sent for disposal;
- ensuring suitable storage of immiscible and contaminated liquid waste for the appropriate amount of time; and
- monitoring the amount of waste generated and disposed via the sewer and maintaining a record of the volume and radioisotopes in each case.

5.3 RADIATION PROTECTION OFFICER

The RPO is responsible for:

- overseeing the compliance of all campuses with the University's radioactive waste disposal procedure;
- selecting the external waste contractor;
- ensuring the implementation of a system for monitoring surface dose rates of each waste package and the clearance of university managed stores by the external contractor

5.4 RADIATION WORKER

- The radiation worker must follow the radioactive waste disposal procedure as outlined below for the entire period of working with ionising radiation.

6. PACKAGING RADIOACTIVE WASTE

Packaging should be undertaken as follows:

6.1 LOW LEVEL SOLID WASTE – GENERAL

- Pack in a thick paper bag with 100µm polyethylene lining ("wetbag")
- Single radionuclide per package
- Activity less than that given in table in 4.8
- Surface dose limit less than;
 - $5\mu\text{Svh}^{-1}$ on dose rate meter; OR
 - for β -emitters: 10 cps on Geiger-Muller detectors; OR
 - for γ -emitters: 100 cps on scintillation detector.
- No sealed sources
- No more than 2/3 full
- No external contamination; use plastic overbag if necessary or desired
- No objects sticking through bag
- Sealed firmly with brown or clear tape. NO trefoil tape.
- Label as per section 6.5

6.2 LOW LEVEL SOLID WASTE – SCINTILLATION VIALS

- Pack in disposal pails provided by disposal contractor
- Single radionuclide per package
- Activity less than that given in table in 4.8
- Surface dose limit less than $5\mu\text{Svh}^{-1}$ OR for β -emitters 10 cps on Geiger-Muller detectors OR for γ -emitters 100 cps on scintillation detector
- Do not over-fill
- If lid does not seal securely, tape with brown or clear tape. NO trefoil tape.
- No external contamination on pail
- Label as per section 6.5

6.3 SHARPS

- Approved plastic biohazard container with single piece of trefoil tape around the diameter
- Activity less than that given in table in 4.8
- Surface dose limit less than $5\mu\text{Svh}^{-1}$ OR for β -emitters 10 cps on Geiger-Muller detectors OR for γ -emitters 100 cps on scintillation detector
- No external contamination
- Label as per section 6.5

6.4 PUTRESCIBLES

- store in freezer until disposal is imminent
- bag to avoid leakage
- overbag with wet bag and comply with low level solid waste requirements

7. LABELLING

A paper label with the following details should be securely affixed, using plastic tape, to the external surface of all containers:

- Academic/Administrative unit name
- Responsible person
- Building and room number
- Phone number
- Radionuclide
- Half life
- Estimated total activity (in MBq) and date
- Description of physical contents
- Signature

8. STORAGE OF RADIOACTIVE WASTE

8.1 WASTE STORES

Monash University has the following storage areas for low level solid radioactive waste:

- **CLAYTON CAMPUS**
 - Faculty of Science store
 - Faculty of Medicine, Nursing & Health Sciences store
 - School of Biomedical Sciences store
- **PARKVILLE CAMPUS**
 - Building 4 store
- **ALFRED HOSPITAL**
 - Hospital based facility
- **MONASH MEDICAL CENTRE/MHRP**
 - Hospital based facility

8.1.1 Academic/Administrative units may use whichever storage area is practical. For Clayton campus stores, collection of waste from the stores is organised by OH&S and costs charged back to the cost centres generating the waste.

8.1.2 In the case of the hospital-based facilities, Monash University uses these by arrangement with the hospital concerned, and users must comply with the hospital's packaging, storage, recordkeeping and access requirements.

8.2 LOW LEVEL SOLID WASTE (WETBAGS, SCINTILLATION PAILS, SHARPS CONTANERS)

8.2.1 comply with packaging requirements (Section 6)

8.2.2 place in appropriate campus store, and within the designated area for that radionuclide/package type

8.3 MEDIUM TERM SOLID WASTE

8.3.1 Longer-lived isotopes (3H, 14C, 22Na) should not be packaged in amounts greater than that shown in section 4.8, as they will not decay to disposal levels within a reasonable time.

8.3.2 Isotopes with shorter half-lives (32P, 33P, 35S, 51Cr, 125I) may be packaged in amounts greater than that in section 4.8 and left for decay if necessary.

8.3.3 Appropriate shielded storage for this waste should be made available in the area where it is generated, Packages left for decay should be clearly marked with the estimated date for disposal.

8.4 LIQUID WASTE

8.4.1 Liquids should be contained in sturdy containers with a long life expectancy (particularly if the liquids are to be kept to decay), which are suitable for transportation if necessary e.g. a disused Winchester.

8.4.2 The following general rules apply to choosing a suitable container:

- Plastics are usually only suitable for use for aqueous liquids.
- Liquids containing solvents must be stored in glass or metal.
- Liquids containing corrosives can usually only be stored in certain types of plastics or glass.
- Liquids must be separated into groups:
 - Miscible with water
 - Immiscible with water
 - Those with significant chemical contamination

8.4.3 No solid material (such as scintillation vials or caps) may be placed into a container with liquid waste.

8.4.4 The container should be securely labelled with the details given in section 7.

9. DISPOSAL OF RADIOACTIVE WASTE

9.1 MISCIBLE LIQUID WASTE

9.1.1 Miscible liquid waste can be disposed of to sewer so long as it is done in accordance with the Department of Health guidelines and AS 2243.4

9.1.2 A dedicated sink for disposal of liquid radioactive waste should be made available. The RSO should be involved in selecting this sink and controlling disposal to it. As it is likely to become contaminated, the sink should be flushed copiously with water each time it is used in order to remove residual contamination.

9.1.3 Where the liquid is too highly active to be put down the sink in a single aliquot, the disposal needs to be spread over a number of days.

9.1.4 The following amounts of individual water soluble radioisotopes represent the maximum activity that any one unit, at any single Monash campus may place down the sewer in any 24 hour period:

Radioisotope	Maximum activity to sewer per building per 24 hour period	
H-3	10MBq	270µCi
C-14	10MBq	270µCi
Na-22	1MBq	27µCi
P-32	1MBq	27µCi
P-33	1MBq	27µCi
S-35	1MBq	27µCi
Cr-51	10MBq	270µCi
Zn-65	1MBq	27µCi
I-125	0.1MBq	2.7µCi
Contact the RPO for information on disposal of other radionuclides		

9.2 PUTRESCIBLES

- 9.2.1 Animal carcasses or other putrescible waste that is radioactively contaminated must be stored in a freezer dedicated to radioactive materials until they have decayed to background levels.
- 9.2.2 If decay to background is not practicable, they should be stored in a freezer dedicated to radioactive materials until disposal via landfill is imminent. They should then be bagged (to avoid leakage) and packed as for low level waste in a wet bag.

10. REFERENCES

10.1 LEGISLATION

Radiation Act (2005)
Radiation Regulations 2007

10.2 CODES OF PRACTICE AND RELATED DOCUMENTS

Recommendations for Limiting Exposure to Ionizing Radiation (Printed 1995 - Republished 2002) and National Standard for Limiting Occupational Exposure to Ionizing Radiation (Printed 1995 - Republished 2002)
Radioactive Material Disposal Requirements, Department of Health

10.3 MONASH UNIVERSITY OHS DOCUMENTS

Manual for Users of Ionising Radiation
Occupational health and safety management at Monash University: Structure, functions, roles and responsibilities
Protecting the unborn child from the effects of ionising radiation
Radiation Safety Manual
Using Ionising Radiation at Monash University

10.4 AUSTRALIAN STANDARDS

AS 2243.4:1998 Safety in Laboratories Part 4 Ionising radiation