Transport of Radioactive Materials Procedure

Section 1 - Purpose and Scope

(1) This Procedure has been developed to assist workers at The University of Queensland (UQ) to manage risks for safety associated with transportation of radioactive materials and provide information on legislative compliance as required by Queensland Radiation Health (QRH).

(2) Transportation of radioactive materials includes between UQ buildings, UQ campuses, within Australia or overseas. The Australian Radiation Protection and Nuclear Safety (ARPANSA) provides clear detailed guidance for the safe transport of radioactive material in the Code for the Safe Transport of Radioactive Material (2019) (ARPANSA's Code).

(3) This Procedure should be read in conjunction with the other UQ Radiation Safety procedures and guidelines.

(4) Licences to possess radioactive substances are held by UQ under the Radiation Safety Act 1999 (the Act) and Radiation Safety Regulation 2021 (the Regulation). These licences allow the possession of various types of radiation sources used in radiation practices. Occasionally, radioactive materials may need to be transported between UQ campuses or consigned for shipment within Australia or overseas. Radiation Possession Licences have also been granted to UQ for the possession and use of sealed sources, some of which are incorporated in portable devices for which transport forms an integral part of their use.

Section 2 - Process and Key Controls

(5) Radiation is highly regulated and has licensing requirements for possession, use and transportation. As such the following key controls are required.

a. The holders of Possession Licences have obligations to ensure that radioactive materials are consigned and transported in compliance with QRH and ARPANSA legislation and their approved Radiation Safety and Protection Plan (RSPP).
b. Radioactive materials are a class of dangerous goods and may require placarding if transported in a vehicle. In some cases, QRH will need to pre-approve the transport of some materials.
c. ARPANSA's Code requires special packing requirements and is quite complex. Before transport of any radioactive material is arranged, the local Radiation Safety Officer (RSO) (find details via UQ Safety Network) or the UQ Radiation Protection Consultant (RPC) must be contacted.

Section 3 - Key Requirements

Types of Transport

Road and Rail Transport

(6) In Queensland, prescribed radioactive substances may only be transported by road or rail under the authority of a licence granted under the Act. Licences granted under the Act are conditional on the user complying with the relevant sections of ARPANSA's Code which is published by the Commonwealth Government and has been adopted by all

Australian States and Territories as the standard regulatory document. The Act provides for road transport, the person in charge of the vehicle must personally hold a licence issued by QRH authorising the transport. However, persons transporting excepted packages or certain devices such as soil moisture and density gauges, are exempted from the requirement to hold a transport licence provided the transport is compliant with ARPANSA's Code.

Air and Maritime Transport

(7) For air transport, the Civil Aviation Safety Authority (CASA) legislation, the Civil Aviation Act 1988, or the International Air Transport Association's Dangerous Goods Regulation are applied as appropriate.

(8) For marine transport outside Australian State and Territorial waters, the International Maritime Dangerous Goods (IMDG) Code must be followed.

(9) Transport of radioactive materials via waterways under the jurisdiction of Australian States and Territories is covered by the ARPANSA Code for the Safe Transport of Radioactive Material (2019). Marine transport of dangerous goods is generally covered by the Australian Maritime Safety Authority's (AMSA) Navigation Act 2012.

(10) Most of the regulatory codes are derived originally from the International Atomic Energy Agency's Regulations for the Safe Transport of Radioactive Materials.

Packaging and Labelling Requirements

(11) The ARPANSA's Code specifies general requirements for packaging and labelling:

a. General requirements for radioactive materials are listed.
b. General requirements for all packaging and packages.
c. Additional requirements for packages transported by air.
d. Requirements for packages containing fissile materials.

(12) More specific requirements about the package types are listed in the ARPANSA's Code based on the radionuclide and the activity. Package labelling is determined by the external radiation levels at the surface and at one metre from the package.

Types of Packages

(13) There are essentially eight types of packages for the transport of radioactive material. The ARPANSA's Code stipulates maximum levels of radiation and specific packaging requirements for each packaging as follows:

a. Excepted package: The requirements for external labelling may be relaxed in favour of an internal label, visible only when the package is opened. Requirements for completion of a shipper's declaration are also waived, but the nature of the shipment must still be noted in the transport documents, i.e., the consignment note, air waybill or bill of lading. In addition, a person transporting an excepted package is exempted from the requirement to hold a Transport Licence.
b. Type A package: Almost all unsealed sources dealt within UQ laboratories can be transported as this packaging. This is packaging which can stand up to normal transport handling, but which is not intended to provide a high degree of security under accident conditions. There is no system of certification for Type A packaging although ARPANSA's Code does specify design requirements and these need to be considered if new packaging is prepared for a specific purpose.
c. Type B (U) package: For high activity sources which require high security - these must be specially certified by national competent authorities for transport.
d. Type B (M) package: For high activity sources which require high security - these must be specially certified by national competent authorities for transport.

e. Type C package: For high activity sources which require high security - these must be specially certified by national competent authorities for transport.
f. Type IP-1 (Industrial package Type 1).
g. Type IP-2 (Industrial package Type 2).
h. Type IP-3 (Industrial package Type 3).

(14) Frequently the packaging in which a source was originally shipped can be reused, provided it is undamaged and is appropriate for the material to be transported. Where there is any uncertainty as to the type of package required, the UQ RPC should be contacted for advice.

Package Labels

(15) There are three categories of package labels. The appropriate label for each package can be determined by surface radiation level as shown in the following table:

Maximum Surface Radiation Level	Package Label Category
Not more than 5 µSv/h	Category I-WHITE
Between 5 µSv/h and 500 µSv/h	Category II-YELLOW
Between 500 µSv/h and 2000 µSv/h	Category III-YELLOW

(16) The labels must be 10 cm on each side and must be completed with the name of the radionuclide and the activity using International System of Units i.e. Becquerel (Bq). Templates for Category I-WHITE, Category II-Yellow and Category III-Yellow labels are presented in Figure 2, 3 and 4 of the ARPANSA's Code respectively.

> See linked image: Templates for Category I-WHITE, Category II-Yellow and Category III-Yellow labels, from Figure 2, 3 and 4 of the ARPANSA's Code

(17) With the Category II YELLOW and Category III YELLOW labels, the Transport Index must also be shown.

(18) Additional important points include:

a. For each package or overpack other than Excepted packages, the United Nations (UN) number and the proper shipping name must be legibly and durably marked on the outside of the packaging. In the case of Excepted packages, only the UN number is required on the outside of the package.
b. Packages which contain liquid sources must include sufficient absorbent material to be able to completely soak up the contents should the inner container be ruptured.
c. Packages containing radioactive material transported by air must have a containment system able to withstand without leakage a reduction in ambient pressure to 5 kPa.
d. All packages to be transported by air must be capable of withstanding ambient temperatures from -40°C to +55°C without impairment of containment integrity.

Consigning Sources

(19) Licences which authorise the use of unsealed radioactive substances for research do not usually include a transport authority, unless transport is specifically authorised by the Use Licence (as with soil moisture gauges), only sub-licensable quantities may be transported.

(20) Where the shipment is being consigned with a commercial carrier, a shipper's declaration must be completed. Details of the information required in a declaration are given in ARPANSA's Code applicable to the mode of transport.

Declaration forms can be obtained from licenced carriers or airlines.

(21) The Radiation Protection Consultant (RPC) must be consulted for advice on completing the form prior to finalisation.

Transport in Vehicles

(22) A UQ vehicle should be used to transport dangerous goods and personal vehicles must not be used.

(23) The package is to be secured in the vehicle at a distance from the driver consistent with minimising exposure to radiation. For example, an Excepted or Category I WHITE package will not require significant separation from the driver, but a package requiring Category II YELLOW or Category III YELLOW labelling must not be carried in the passenger compartment of a sedan or in the seating area of a station wagon.

(24) For all packages, other than those classed as Excepted, the vehicle must carry a warning placard on the outside rear and on each side. The placards must be of the kind specified in ARPANSA's Code as demonstrated in the image linked below.

> See linked image: Radioactive material placard as specified in ARPANSA's Code.

(25) Where the vehicle is carrying a soil moisture/density gauge or hydrology probe, the instrument must be carried in a specially designed transport case with the source secured in the off position (if applicable). The case must not be stowed in the passenger compartment or seating area of a station wagon and must be secured against movement - particularly important when carrying a gauge in the tray of a truck. Placarding as described above is required when transporting all soil moisture/density gauges and hydrology probes.

(26) In general, packages containing radioactive materials must not be transported in the same vehicle with other dangerous goods, and never in food or drink containers. Exceptions to this rule are made in the case of non-flammable non-toxic gases (dangerous goods class 2.2), poisonous gases (class 2.3), poisonous substances (class 6) and miscellaneous dangerous goods (class 9).

Vehicle Accidents and Emergencies

(27) In the event of a vehicle accident, the essential requirement is, except for actions necessary to save life or to give other necessary medical assistance, access to the vehicle and its immediate surroundings must be restricted until appropriately trained persons can reach the site.

Section 4 - Roles, Responsibilities and Accountabilities

Possession Licensee

(28) UQ has been granted three Possession Licences for the radiation sources under the Act. The Possession Licensee is responsible for ensuring compliance with both the legislation and specific licence conditions.

a. The Chief Operating Officer of UQ is the nominee for one possession licence that encompasses the majority of UQ's radiation equipment, radioactive substances and Class 4 lasers used in medical, cosmetic or related procedures.
b. Director of the Centre for Advanced Imaging (CAI) is the licence nominee of another possession licence for the radiation equipment and radioactive substances used in CAI.

c. Director of the Herston Imaging Research Facility (HIRF) is the licence nominee of the third possession licence for the radiation equipment and radioactive substances in HIRF.

(29) The Possession Licensee can nominate a nominee to carry out activities on their behalf and this can be any senior executive member. To be nominated, the Senior Executive member must contact the HSW Division so the process can be completed and QRH be informed of the nomination.

Nominee

(30) The Nominee's responsibilities, which can be delegated to Executive Deans, Institute Directors or Heads of School (HOS), are as follows:

a. implement an RSPP for the practice to be followed by all persons involved in carrying out the radiation practice;
b. appoint a Radiation Safety Officer (RSO);
c. apply for Approval to Acquire for each radiation source or continuing to acquire unseal sources (if applicable);
d. ensure radiation sources in their area of responsibility, the premises in which they are used, and where radioactive substances are stored, comply with the relevant Radiation Safety Standards whenever the radiation practice is being carried out;
e. apply for Approval to Relocate a radiation source to a place outside of Queensland's jurisdiction;
f. ensure the disposal of radioactive material is in a manner consistent with their RSPP and the concentration of radionuclides in the material is less than that prescribed in the Regulation;
g. apply for an Approval to Dispose if the Possession Licensee wishes to dispose of radioactive material in excess of the disposal levels prescribed in the Regulation; and
h. ensure compliance with both the legislation and the licence conditions.

Radiation Safety Officer (RSO)

(31) The Act requires each Possession Licensee to appoint a qualified RSO. The RSO is required to:

a. hold an RSO Certificate relevant to the radiation practice;
b. advise the Possession Licensee/nominee about the radiation safety status of the practice and ways to remedy issues or improve safety;
c. inform the HSW Division, via the RPC, of the status of radiation safety of the practice;
d. identify whether the licensee's approved RSPP for the practice is being complied with by recommending the activities to be taken to ensure compliance with the RSPP;
e. identify and advise the Possession Licensee/nominee of ways to minimise exposure to radiation to people from the radiation source;
f. provide or arrange the provision of training to users;
g. identify whether the Act, Regulation, RSPPs and applicable radiation safety standards for the radiation source and premises where the practice is being carried out are being complied with, and report to the Possession Licensee/nominee any contravention and recommend the actions that need to be taken to ensure compliance with the standards;
h. review the RSPP regularly to ensure its continued effectiveness and advise the Possession Licensee/nominee of the results of the review;
i. provide or arrange the provision of personal monitors when required;
j. ensure the disposal of radioactive waste is compliant with the legislation and the RSPP;
k. keep and maintain required records, e.g., register of radiation apparatus, register of radioactive waste, radiation monitoring results, equipment maintenance, source shipments, waste management and records of training;

l. supervise the management of radioactive waste and provide specialist advice and assistance where necessary to ensure safety, e.g., incident recovery and clean-up operations;
m. audit the storage of radioactive waste at least every six months as per the Management and Disposal of Radioactive Waste Procedure;
n. report as required to the Possession Licensee/nominee and the HSW Division regarding any issues or changes that may affect the Possession Licence;
o. ensure users are appropriately licensed where applicable;
p. monitor and review of personal radiation dose where applicable;
q. ensure risk assessment, licence, approval and compliance certificates are in place and current;
r. review relevant documentation to ensure the effectiveness of RSPP, SOP, risk assessment, etc.;
s. ensure all persons have access to the relevant RSPPs;
t. ensure audits of radiation practices and compliance with radiation safety legislation, including records of radiation licences, RSPPs, approvals and Compliance Certificates are kept in radiation database and recorded in the register of radiation apparatus;
u. assist with the decontamination and cleanup if required, reporting and investigation; and
v. conduct regular review of relevant documentation such as RSPP, SOP, risk assessment, etc. to ensure the document effectiveness.

Radiation Protection Consultant (RPC)

(32) The RPC provides overall guidance to all UQ workers on matters pertaining to radiation. The RPC monitors the implementation of UQ's RSPPs as approved by the regulatory authority, provides support for radiation governance and compliance across UQ and monitors compliance with radiation safety legislation.

(33) The RPC is the primary source of advice and expertise for:

a. Radiation legislative and scientific requirements;
b. RSPPs;
c. radiation research project approvals;
d. Overall guidance to RSOs; and
e. Radiation safety training for radiation users.

(34) In addition, the RPC provides reports regularly via the Director, Health Safety and Wellness, to Possession Licence nominees about any issues or changes that may affect the Possession Licence.

User

(35) The primary responsibilities of a user are to:

a. hold the relevant licence if required;
b. abide by the conditions stated in their licence;
c. ensure any radiation dose received by a person is not higher than the limits prescribed in the Regulation and are as low are reasonably achievable;
d. minimise risks to persons in the environment to reduce harm;
e. update the register of radioactive waste;
f. dispose of their radioactive waste appropriately;
g. ensure the therapeutic or diagnostic procedure prescribed by authorised persons, or under approved human ethics program, if applicable;
h. notify the RSO of any incident;

i. clean up after a spill (after first seeking advice from RSO or RPC);
j. report the incident in UQSafe database;
k. assist with the incident investigation; and
l. maintain accountability for radiation sources used under the Possession Licence authority and ensure the licensee is adequately informed of any issues that might affect radiation safety or of any actions needed to be taken to ensure compliance with the RSPP and Regulation.

Consignor

(36) To ensure that packages containing radioactive material are safe to handle under normal conditions, the consignor is responsible for:

a. packaging and labelling radioactive materials for transport in accordance with ARPANSA's Code;
b. preparing and certifying the transport documentation as required by ARPANSA's Code; and
c. ensuring all transport documentations are complete and signed where applicable.

Health, Safety and Wellness Division

(37) Health, Safety and Wellness Division (HSW Division) is responsible for maintaining the required level of central oversight and assurance by:

a. employing an RPC to oversee the safe management of radiation use at UQ;
b. assessing whether organisational units and UQ workers can demonstrate compliance with UQ radiation procedure guidelines, RSPP and licence conditions; and
c. reporting to Queensland Radiation Health and investigating any incidents, as required.

Radiation Safety Officers Network

(38) This is a formal network of UQ Radiation Safety Officers. The forum allows the RPC and RSOs to consult on, and review regulatory, organisational and technical radiation matters at UQ.

(39) The Radiation Safety Officers (RSO) Network meets four times a year and is chaired by the RPC. All participants are invited to contribute discussion and presentation items for the meeting. The RSO community provide secretariat duties as needed. All presentations and minutes are retained by HSW Division.

Section 5 - Monitoring, Review and Assurance

(40) The RPC oversees radiation safety arrangement at UQ and reviews the specific aspects of radiation safety regularly. Local RSO communicate radiation safety issues to the RPC as required.

Section 6 - Recording and Reporting

(41) Radiation licences, RSPPs, approvals and compliance certificates are kept in UQSafe and reviewed regularly by RSOs to keep the documentation updated. Local RSOs are responsible for reporting any deficiency or non-compliance within the Organisational Unit to the Possession Licensee and RPC. All incidents must be submitted through UQSafe.

Record Keeping

(42) Personal radiation dose monitoring records are to be kept for the duration of the wearer's working life. The records are to be kept until the later of the following days: not less than 30 years after the last exposure assessment,

or at least until the person has reached the age of 75 years.

(43) In practice, radiation monitoring records will continue to be kept by local RSO for the Possession Licensee.

(44) The consignor must ensure that the transport record is kept and the information may be provided to the regulator for auditing purposes if required.

Incident Procedures

(45) If a package containing radioactive material has been damaged and it is suspected that the damage may allow radiation leakage or spillage of the radioactive material, the carrier or other person dealing with the incident must:

a. provide first aid to injured persons;
b. not touch the package;
c. notify the carrier's supervisor or manager and the consignor of the package, then the consignor informs the local RSO;
d. evacuate and control access to the incident area until the arrival of appropriate personnel to control the situation;
e. immediately notify QRH of the incident through HSW Division;
f. follow any instructions to control the incident given by the consignor or QRH officers;
g. not eat, drink or smoke while at the incident site;
h. identify persons or equipment that may have been contaminated by radioactive material or exposed to radiation; and
i. provide a written report to QRH within seven days, advising of:
    i. location of incident;
    ii. nature and cause of incident;
    iii. actions taken to contain incident;
    iv. clean up procedures and environmental concerns;
    v. any person exposed or possibly exposed; and
    vi. proposals aimed at avoiding a recurrence.

Section 7 - Appendix

Definitions

Term	Definition
Carrier	Any person or organization undertaking the carriage of radioactive material by any means of transport.
Competent Authorities	List of competent authorities can be found in Schedule B of ARPANSA’s Code.
Consignor	Any person or organisation that prepares a package of radioactive material for transport.
Excepted Packages	A package if it meets one of the following conditions: 1. it is an empty package having contained radioactive material; 2. it contains instruments or articles not exceeding the activity limits specified in Table 4 in ARPANSA’s Code; 3. it contains articles manufactured of natural uranium, depleted uranium or natural thorium; 4. it contains radioactive material not exceeding the activity limits specified in Table 4 in ARPANSA’s Code; 5. it contains less than 0.1 kg of uranium hexafluoride not exceeding the activity limits specified in column 4 of Table 4 in ARPANSA’s Code.

Term	Definition
Overpack	an enclosure used by a single consignor to contain one or more packages, and to form one unit for convenience of handling and stowage during transport.
Radiation Protection Consultant (RPC)	A qualified expert appointed by the responsible person to supervise radiation safety activities and to ensure radiation safety. An RPC is deemed to have the authority to implement procedures and to intervene in situations where safety has been or is being compromised.
Radiation Safety and Protection Plan (RSPP)	Is the risk management plan for a particular type of radiation practice. The relevant RSPP must be complied with by all users and other persons involved in the practice.
Radiation Safety Officer (RSO)	For a radiation practice, means a person who holds a relevant certificate issued under the Act and who the possession licensee nominee has appointed as the radiation safety officer for the particular practice.
Radioactive substances	Sealed: a radioactive substance sealed in a way that minimises the possibility of its escape or dispersion; and allows the emission or transmission of ionising radiation. Unsealed: a radioactive substance that is not a sealed radioactive substance.
Transport Index (TI)	A number assigned to a package, overpack or freight container, or to unpackaged LSA-1 or SCO-1, to assist in providing control over radiation exposure. In general, the TI corresponds to the radiation level (in units of millisieverts per hour) at 1 metre from the surface of a package multiplied by 100.
UQ workers	For the purposes of this Procedure include: • staff - continuing, fixed-term, research (contingent funded) and casual staff; • visiting academics and researchers; • academic title holders, visiting academics, Emeritus Professors, adjunct and honorary title-holders, Industry Fellows and conjoint appointments; • Higher Degree by Research students; and • volunteers and students undertaking work experience.

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