RADIATION PROTECTION PLAN FOR THE TRANSPORT OF RADIOACTIVE MATERIAL - HAZRAD AUSTRALIA Pty Ltd

HAZ-OHS-TMP-01
Revision: Submission to RCWA

<table>
<thead>
<tr>
<th>Revision Number</th>
<th>Issue Date</th>
<th>Prepared by</th>
<th>Reviewed by</th>
<th>Revision Description</th>
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<tr>
<td>0</td>
<td>21-6-18</td>
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RECORD OF ENDORSEMENT

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
<th>Signature</th>
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<td>Simon Booth</td>
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</tbody>
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1. Purpose

This Radiation Protection Program (RPP) has been developed for HazRad Australia (HazRad) to cover all aspects of the packing, loading, handling, storage in transit and transport of radioactive material:

- to and from HazRad, Bibra Lake premises; and
- to Tellus Operations Sandy Ridge worksite for ultimate disposal

The general objectives of this RPP are:

- To ensure that any activities associated with the transport of radioactive material undertaken by HazRad are compliant with Western Australian regulatory requirements;
- To minimise any adverse effects on people, damage to property or harm to the environment as a result of any activities associated with the transport of radioactive material;
- To facilitate a rapid and effective emergency response and recovery;
- To provide guidance and assistance to emergency and security services; and
- To communicate vital information to all relevant persons involved in the transport incident/emergency (both internal personnel and external agencies) with a minimum of delay.

This RPP applies to transport and associated activities containing radioactive material, using the applicable regulatory definition.

For the purposes of transport in Western Australia, radioactive material is defined by the Radiation Safety (Transport of Radioactive Substances) Regulations (WA, 2002) which adopts the definition given by the International Regulations (Section II para 236).

Under this definition (which may also be found in the Transport Code [3]), radioactive material is that which contains activity concentrations and total activities exceeding those listed for each radionuclide (para 402 – 406 of the Transport Code [3]).

2. Scope

The RPP is intended as a framework for the management of packaged radioactive material only and describes working principles to minimise the potential radiological risks to workers, the public and the environment.

HazRad has a separate general Radiation Management Plan (RMP) that covers:

- the storage of packaged and unpackaged radioactive material; or
- dealing with unpackaged radioactive material (ie, devices that are not contained within a packaged form).

This RPP does not cover activities such as:

- Those identified as being covered in the general RMP mentioned above;
- any transport or associated activities for material which requires management in regard to criticality, as defined under relevant federal and international legislation; or
- any transport of radioactive material outside of Western Australia.
3. Regulatory Framework

Transport of radioactive material within Australia is regulated under a range of federal, state and territory regulatory frameworks. International laws and regulations are also relevant, and are generally adopted into federal, state and territory legislation.

HazRad bears responsibility for ensuring regulatory compliance, and this RPP has been developed to meet the requirements of applicable legislation.

This RPP has been prepared to address requirements of:

- Radiation Safety Act (WA, 1975)
- Radiation Safety (General) Regulations (WA, 1983)
- Radiation Safety (Transport of Radioactive Substances) Regulations (WA, 2002)

With reference to:

- Radiation Protection Series 11, Code of Practice for the Security of Radioactive Sources (ARPANSA, 2007)

Under the Radiation Safety (Transport of Radioactive Substances) Regulations (WA, 2002),

"The (Transport) Code and the International Regulations, as modified by these regulations, are adopted for the purposes of regulating the transport of radioactive materials in Western Australia and the storing, packing and stowing of radioactive materials for transport in Western Australia."

Radiation legislation is implemented at a state level and each state or territory of Australia maintains discrete legislation and regulatory capacity. Any interstate transport of radioactive material must be compliant with the regulatory requirements of the state or territory of origin, and the destination state or territory as well as any other jurisdictions through which the material may pass during transit. This RPP has been prepared to address the requirements of Western Australian legislation only.


Material may also have (non-radiological) characteristics that causes it to be classified as dangerous goods. Storage and transport of this material may require compliance with the Australian Dangerous Goods Code (ADGC) or, with the International Maritime Dangerous Goods (IMDG) Code for transport by sea.
4. Roles & Responsibilities

This RPP shall be managed by a suitably qualified person, appointed by HazRad. The person having overall responsibility for the RPP must ensure that all requirements of the RPP are in place, including:

• Training of workers and implementation of proper working procedures;
• Assessment of worker exposures, if necessary by individual monitoring or area monitoring;
• Fulfillment of any permitting, licensing or paperwork requirements;
• Labeling/placarding of packages, overpacks or vehicles if/as required; and
• Ensuring emergency response equipment and procedures are aligned with and incorporated into the HAZRAD Emergency Management Plan (EMP) [HOLD 12].

If an external Transport Services Provider (TSP) is engaged, the person responsible for managing the RPP will hold responsibility for ensuring that the contracted company has awareness of and means of compliance with regulatory requirements for the transport of radioactive material either under this RPP or under an approved RPP administered by the contracted company.

Table 1: Company Details [HOLD 11]

<table>
<thead>
<tr>
<th>Company</th>
<th>HazRad Australia Pty Ltd ABN: 27 626 763 782</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sites</td>
<td>6/34 Barberry Way Bibra Lake WA 6163</td>
</tr>
<tr>
<td>Registration #</td>
<td>Pending</td>
</tr>
<tr>
<td>Responsible Person</td>
<td>David Reddie 0497 007 081 <a href="mailto:david@hazrad.com.au">david@hazrad.com.au</a> General Manager HAZRAD Australia</td>
</tr>
<tr>
<td>Radiation Safety Officer (RSO) TRANSPORT ONLY</td>
<td>Samuel Jackson 0413 253 558 <a href="mailto:samuel@hazrad.com.au">samuel@hazrad.com.au</a></td>
</tr>
<tr>
<td>Interim Radiation Safety Officer (RSO) / Responsible Licensee</td>
<td>Simon Booth – Senior RPA 0417 966 438 08 9418 4200 <a href="mailto:simon@hazrad.com.au">simon@hazrad.com.au</a> Licence # LS 223/2008 17363</td>
</tr>
<tr>
<td>Alternate licensees / RSOs</td>
<td>Name Contact Name Contact</td>
</tr>
</tbody>
</table>
4.1. Responsibilities of the Consignor

It is the consignor’s responsibility to ensure that, for all transport of packages containing radioactive material:

- Packaging meets regulatory requirements for the classification of the package;
- Packages are correctly classified, marked, labelled, placarded and/or certified as required under regulations;
- All required paperwork has been correctly completed, dated and signed;
- The consignment is in a condition for transport as described by regulations;
- The carrier is informed of the package classification.

For transport and related activities being conducted under this RPP, when HAZRAD Services is the consignor, the appointed manager of the RPP must ensure that these responsibilities are met. When a third party is the consignor, HAZRAD Services is committed to verifying the information provided by the consignor meets regulatory requirements.

Specific roles may be delegated by the appointed person(s) to fulfill duties required for compliance, including:

- Acquiring and compiling information relating to the material for verification or for determining applicability of legislation, including:
  - Description of the material (physical form, isotope(s), activity etc);
  - Type of package to be shipped;
- Determining requirements for packaging, labeling and permits or other paperwork, and ensuring that these are completed and submitted or available as required:

Shipper’s declaration:

- Labels on packages, containing all required information;
- Markings on the package;
- Certificate of conformance with the contamination limits;
- Placarding of the conveyance;
- Measurements of dose rates around the loaded conveyance;
- Emergency procedures for accidents during transport.

- Developing procedures and plans for company use and communicating requirements to relevant stakeholders. This may include:
  - Incident/accident/emergency response procedures;
  - Conditions for storage-in-transit, loading and securing of the packages on to the conveyance;
  - Engagement with stakeholders to ensure awareness and alignment with compliance requirements.

The following persons may be called upon to undertake the above duties:

- Stores or Logistics personnel;
- Driver(s);
- Loaders;
- Acceptance staff;
- External specialist/consultant.
4.2. Responsibilities of the Carrier

It is the carrier’s responsibility to ensure that:

- All drivers involved in the transportation are licensed, or supervised by someone licensed, under the Radiation Safety Act to transport Dangerous Goods Class 7 - Radioactive Material;
- All drivers are provided with training in the health & safety and general environmental awareness issues related to the transport;
- All drivers are familiar with the purpose and significance of the transport documentation;
- The integrity of packages has not been compromised prior to loading and that they are loaded correctly for transportation;
- In the case of NORM, exterior surfaces of the packages are demonstrated to be free of contamination; and

If an external Transport Services Provider is engaged, the person managing the RPP should engage with them openly, ensuring that they are aware of these responsibilities.

5. Transport Methodology

Each item or package or conveyance transported under the RPP is likely to have differing physical and radiological characteristics. Consequently, classification, packaging, labelling and other requirements will be individually determined in each instance to ensure that transport and associated activities (e.g. packaging, storage in transit etc) are conducted in compliance with legislation, and observing the general objectives of the RPP.

An assessment will be conducted for each item, package or conveyance to ensure that appropriate and compliant controls and management are in place for transport and associated activities. Some basic principles will apply to guide assessment outcomes.

5.1. General

Exposures to employees, the public and to the environment shall be maintained to levels As Low As Reasonably Achievable (the ALARA principle). This may be achieved by the use of controls, commensurate to the level of risk associated with the material or practice.

Awareness or competency training will be provided to personnel (employees or contractors) as appropriate. Refresher training will be provided to long term personnel on a regular basis or after a significant break from work with material considered under the RPP.

Dose estimates will be performed to ensure that: any potential exposure scenarios may be intercepted, that exposures are measured, and that practices and controls may be continuously improved.

5.2. Storage

Storage of radioactive material will be performed in accordance with [HOLD 1: RMP].

This RPP does NOT cover or address storage requirements.

Note: HAZRAD is not classified as conducting ‘storage in transit’. 
6. Radiation Monitoring

This section refers to radiation monitoring requirements for transport purposes only.

Radiation monitoring for purposes NOT related to transport are covered in HAZRAD’s Radiation Management Plan [HOLD 1: RMP].

The following monitoring shall be conducted prior to, during and after each transport of radioactive material. These principles apply when HAZRAD is consigning, transporting, or receiving radioactive material, or verifying compliance when a third-party is involved.

HAZRAD has a [HOLD 4] radiation survey meter, that allows the measurement of [HOLD 4].

Table 2: Summary of Radiation Monitoring for Transport of Radioactive Material

<table>
<thead>
<tr>
<th>STAGE OF TRANSPORT</th>
<th>TYPE OF MONITORING</th>
<th>LOCATIONS</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to Packaging</td>
<td>Determination of package contents (radionuclide(s) and approximate activity concentration)</td>
<td>Item surface</td>
<td>Determination of package status under regulations. Guidance on type of monitoring required.</td>
</tr>
<tr>
<td></td>
<td>Surface contamination (for items being sent with additional packaging)</td>
<td></td>
<td>Ensure that no removable contamination is present. Determination of status as Surface Contaminated Object (SCO)</td>
</tr>
<tr>
<td>After Packaging, Prior to Loading</td>
<td>Gamma – Survey meter</td>
<td>Package surface AND 1m from all sides</td>
<td>Verification of package type (as defined by the Transport Code [3]). Determination of Transport Index if required.</td>
</tr>
<tr>
<td></td>
<td>Surface contamination – Contamination monitor or wipe tests</td>
<td>Package surface</td>
<td>Check for contamination prior to transport</td>
</tr>
<tr>
<td>After Loading</td>
<td>Gamma – Survey meter</td>
<td>Vehicle surface, driver location</td>
<td>Verification dose rates are within limits</td>
</tr>
<tr>
<td>During Transport</td>
<td>[HOLD 2: PRMD] Personal Gamma monitoring - Thermoluminescent Dosimeter (TLD) and/or Personal Electronic Dosimeter (PED)</td>
<td>Driver, co-driver / driver’s assistant if applicable</td>
<td>Measurement of doses received</td>
</tr>
<tr>
<td>On receipt of package for storage</td>
<td>Gamma – Survey meter</td>
<td>Package surface AND 1m from all sides</td>
<td>Verification that package has retained integrity</td>
</tr>
<tr>
<td></td>
<td>Surface contamination – contamination monitor and wipe tests</td>
<td>Package surface</td>
<td>Verification that package has retained integrity</td>
</tr>
<tr>
<td></td>
<td>Surface contamination – contamination monitor and wipe tests</td>
<td>Vehicle</td>
<td>Verification no leakage of radioactive material during transport</td>
</tr>
<tr>
<td>Or suspicion of leakage of NORM</td>
<td>Gamma – Survey meter or Surface contamination Monitor</td>
<td></td>
<td>Incident scenario – refer to section 10</td>
</tr>
</tbody>
</table>
All equipment must have a current calibration certificate.

NOTE: A typical radiation survey meter is capable of detecting (and often measuring) gamma radiation levels. On occasion, it is likely that HAZRAD Services will be dealing with radionuclides, such as Am-241Be sources, which emit both gamma and neutron radiation. Neutron radiation requires specialised radiation detection equipment, although it may be possible to estimate the neutron dose rate based on:
- Source/device manufacturer information;
- Information provided to allow estimation of the neutron dose rate, based on the gamma/neutron dose relationship;
- Any marked Transport Indexes should take into account the total dose rate, which will include the neutron dose rate.

6.1. Dose Assessment
Radiation exposures resulting from exposure to material transported under this RPP will be monitored to ensure that no person receives a dose exceeding the relevant regulatory limit. Controls and standard procedures will maintain doses to levels As Low As Reasonably Achievable (the ALARA principle).
Radiation dose limits detailed in Table 4 for radiation workers and members of the general public have been drawn from the ARPANSA Planned Exposure Code.
Further information relating to HAZRAD's designation of workers can be found in HAZRAD's RMP [HOLD1].

### Table 3 Typical Radiation Monitoring Equipment for Transport Scenarios

<table>
<thead>
<tr>
<th>TYPE OF MONITORING</th>
<th>INSTRUMENT REQUIREMENT</th>
<th>INSTRUMENT INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gamma survey</td>
<td>Gamma survey meter with audible alarm capable of displaying either uSv/h or uGy/h</td>
<td></td>
</tr>
<tr>
<td>Surface contamination (meter)</td>
<td>Alpha/beta/gamma contamination probe (e.g: pancake contamination probe) attached to an alarming ratemeter</td>
<td></td>
</tr>
<tr>
<td>Surface contamination (wipe test)</td>
<td>Wipe test kit containing wipes, gloves, bags, pens and a pair of tongs for conducting the wipes. Sample counting system for counting wipes.</td>
<td></td>
</tr>
<tr>
<td>Personal gamma</td>
<td>Alarming personal electronic dosimeter (PED) that displays accumulated dose in uSv</td>
<td></td>
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### Table 4 – Annual Dose Limits

<table>
<thead>
<tr>
<th></th>
<th>Occupational/ Designated Radiation Worker1</th>
<th>Radiation Worker (not designated)</th>
<th>Non-Radiation Worker</th>
<th>Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual whole body exposure (IWDE)</td>
<td>20 mSv2</td>
<td>1 mSv2</td>
<td>1 mSv2</td>
<td>1 mSv2</td>
</tr>
<tr>
<td>IWDE single year maximum</td>
<td>50 mSv</td>
<td>5 mSv</td>
<td>5 mSv</td>
<td>5 mSv</td>
</tr>
<tr>
<td>Lens of eye</td>
<td>20 mSv</td>
<td>15 mSv</td>
<td>15 mSv</td>
<td>15 mSv</td>
</tr>
<tr>
<td>Skin</td>
<td>500 mSv</td>
<td>50 mSv</td>
<td>50 mSv</td>
<td>50 mSv</td>
</tr>
<tr>
<td>Hands &amp; feet</td>
<td>500 mSv</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

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Notes and points for consideration:

1. Designated radiation workers shall be personally monitored for their radiation exposure. The Responsible Person is required to keep the number of Designated Radiation Workers to a minimum.

2. When averaged over 5 years.

3. In accordance with RPS C1, accidental exposures from emergency situations should be treated separately from the above limits.

4. After a staff member declares her pregnancy, the foetus is afforded the same level of protection and therefore dose limits are as a member of the public.

Doses shall be estimated, by calculation (if not directly monitored using TLDs and/or PEDs), and any doses above regulatory limits (or a pro-rata amount) shall be further investigated and reported. (Refer to section 10)

Constraint levels will be applied to personnel doses to restrict individual exposures. The International Commission for Radiological Protection (ICRP) defines a dose constraint as a restriction on the individual dose which serves as an upper bound on the predicted dose. Doses above constraint levels indicate that protection is unlikely to be optimised, and that investigation is required along with implementation of appropriate controls. Dose constraints are lower than the relevant dose limits defined in Table 4.

Employees belonging to the Similar Exposure Group (SEG) having the highest potential for exposures above background (e.g. competent personnel involved with loading and handling of consignments such as drivers and onsite RSOs) will be considered to be non-designated ‘radiation workers’ and will have a dose constraint of 0.7 mSv applied to their annual occupational effective dose. All other employees will have a dose constraint of 0.3 mSv applied to their annual occupational effective dose.

It is anticipated that workers (e.g. loaders, drivers) will not receive doses in excess of the public dose and non-designated radiation worker limit of 1mSv per year. [HOLD 3: TBC]

Any doses above the constraint level shall be reported immediately to the Radiological Council and reported confidentially in writing to the employee. The dose reports should be accompanied by explanation of the occupationally received dose in the context of radiation exposures from other sources. The employer is required to keep the dose records and provide to the employee upon request.

7. Road & Sea Transport Procedures

For each transport of radioactive material, every aspect of the transport (including packaging, loading, transport and storage in transit) shall be conducted according to the requirements set out in the Transport Code [3] and other relevant legislation e.g. ADGC or IMDG Code.

Note: Classification, packing, marking, labelling and documentation are the responsibility of the consignor, i.e., the person presenting the goods for transport. This responsibility may be delegated to specialist or consultant personnel for any leg of the journey (including transport by road and/or transport by sea.)

Transport requirements for radioactive material sent as sea freight are the same as those for road transport (some variation may exist to ensure compliance with the IMDG Code) and the items should be manifested through to their final destination. Items must not leave their departure point (typically, the consignee) until it is established that the receiving location is authorised to receive them.

ALL workers involved in the handling, packaging, loading, transport and offloading of Radioactive Material shall receive training with regard to safety in transporting radioactive material.

Training will be commensurate to the exposure risk of the individual, but as a minimum will involve an induction covering the topics outlined in Section 11 (Training) including the emergency procedures to be followed in case of an incident or accident during transport (these may also be found on the reverse side of the Class 7 – Shippers Declaration).

Requirements on the packaging, labeling, contamination, dose rates are detailed in the Transport Code [3].
7.1. Packaging of Radioactive Material  
[HOLD 5: Packaging of Radioactive Material approvals, procedures, etc, to be developed]

7.2. Package Design Requirements  
The Regulations (by adoption of the Transport Code [3]) provide for five different types of package:

• Excepted;
• Industrial;
• Type A;
• Type B;
• Type C.

7.2.1. Excepted packages  
Excepted packages are those in which the amount or concentration of radioactive material and the associated dose rates are restricted to such low levels that the consignment presents a very limited radiological risk. Packaging does not require special testing for containment or shielding integrity but must be sufficiently robust to withstand routine and normal conditions of transport and bear the words “RADIOACTIVE” on an internal surface.

Excepted packages must:

• Have a surface dose rate of less than 5 µSv.hr⁻¹; and
• Contain concentrations or quantities of radioactive material less than those specified in the Transport Code [3] (para 408, Table 3).

Table 5 Extract from the Transport Code [3] (ARPANSA, 2008) ACTIVITY LIMITS FOR EXCEPTED PACKAGES

<table>
<thead>
<tr>
<th>Physical state of contents</th>
<th>Instrument or article</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Item limits a</td>
<td>Package limits a</td>
</tr>
<tr>
<td>Solids:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special form</td>
<td>$10^{-3} A_1$</td>
<td>$A_1$</td>
</tr>
<tr>
<td>Other forms</td>
<td>$10^{-5} A_2$</td>
<td>$A_2$</td>
</tr>
<tr>
<td>Liquids</td>
<td>$10^{-4} A_2$</td>
<td>$10^{-1} A_2$</td>
</tr>
<tr>
<td>Gases:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tritium</td>
<td>$2 \times 10^{-2} A_1$</td>
<td>$2 \times 10^{-1} A_2$</td>
</tr>
<tr>
<td>Special form</td>
<td>$10^{-3} A_1$</td>
<td>$10^{-2} A_1$</td>
</tr>
<tr>
<td>Other forms</td>
<td>$10^{-4} A_2$</td>
<td>$10^{-2} A_2$</td>
</tr>
</tbody>
</table>

a For mixtures of radionuclides, see paras 404–406 of the Transport Code [3].
7.2.2. Industrial Packages - Type IP-1, IP-2, IP-3 packages

Industrial packages are used to transport two types of material:

- Material having low activity per unit mass – known as Low Specific Activity (LSA) material; or
- Non-radioactive objects having low levels of surface contamination – known as Surface Contaminated Objects (SCO).

Industrial Packages (IP) are sub-divided into three categories designated as IP-1, IP-2 and IP-3, which differ regarding the degree to which they are required to withstand routine and normal conditions of transport. Packages used in industry such as steel drums or bins could meet the various requirements, but purpose designed packages are also frequently used. The choice of packaging depends on the characteristics of the material under transport.

General requirements for all package types:

- Practical design – allow safe handling, securing, lifting, snag-free, easy decontamination, avoid water retention, etc
- Designed for temperature and pressure variations
- Take into account the contents’ other DG properties (if applicable)
- Air transport has additional requirements (not covered by this RPP)

Requirements for IP-2 packages:

- As per IP-1, plus subjected to tests as detailed in sections 722, 723 of the code to prevent:
  - loss or dispersal of contents
  - a more than 20% increase in external surface dose rate

Requirements for IP-3 packages:

- As per IP-1, plus:
  - Minimum 10 x 10 x 10cm
  - Tamper-proof seal
  - An adequate “containment system” (to retain pressure). Special form certification meets this requirement

Some typical materials transported in industrial packages are low-level and intermediate-level radioactive waste, or ores containing naturally occurring radionuclides (e.g. uranium or thorium) and concentrates of such ores. NORM may also be transported in industrial packages.

Detailed information is given in the Transport Code [3] (Table 4) relating to requirements for packaging.
7.2.3. Type A packages

Type A packages are used for the transport of relatively small, but significant, quantities of radioactive material. Since it is assumed that this type of package theoretically could be damaged in a severe accident and that a portion of their contents may be released, the amount of radionuclides they can contain is limited by the IAEA Regulations. In the event of a release, these limits ensure that the risks from external radiation or contamination are very low.

Type A packages are required to maintain their integrity during normal transport conditions and therefore are subjected to tests simulating these conditions. Type A packages are used to transport radioisotopes for medical diagnosis, fixed industrial gauges, and borehole logging gauges.

Type A packages shall not contain activities greater than the A1 value for special form radioactive material or A2 for all other material. (Table 7)

---

Table 6 - Extract from Transport Code [3] - INDUSTRIAL PACKAGE REQUIREMENTS FOR LSA MATERIAL AND SCO

<table>
<thead>
<tr>
<th>Radioactive contents</th>
<th>LSA-I</th>
<th>LSA-II</th>
<th>LSA-III</th>
<th>SCO-I</th>
<th>SCO-II</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Solid</td>
<td>Solid</td>
<td>Liquid</td>
<td></td>
<td>Liquid</td>
</tr>
<tr>
<td></td>
<td>Type IP-1</td>
<td>Type IP-2</td>
<td>Type IP-2</td>
<td>Type IP-1</td>
<td>Type IP-2</td>
</tr>
<tr>
<td></td>
<td>Type IP-1</td>
<td>Type IP-2</td>
<td>Type IP-2</td>
<td>Type IP-1</td>
<td>Type IP-2</td>
</tr>
</tbody>
</table>

*Under the conditions specified in para. 523, LSA-I material and SCO-I may be transported unpackaged.*
**Table 7: Typical A1 and A2 values for common radionuclides: (Full list is available in Transport Code [3])**

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>A1 (TBq)</th>
<th>A2 (TBq)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Am-241</td>
<td>10</td>
<td>0.001</td>
</tr>
<tr>
<td>C-14</td>
<td>40</td>
<td>3</td>
</tr>
<tr>
<td>Cd-109</td>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>Cf-252</td>
<td>0.05</td>
<td>0.003</td>
</tr>
<tr>
<td>Co-60</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Cs-137</td>
<td>2</td>
<td>0.6</td>
</tr>
<tr>
<td>I-125</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>I-131</td>
<td>3</td>
<td>0.7</td>
</tr>
<tr>
<td>Ir-192</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>Mo-99</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>P-32</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Ra-226</td>
<td>0.2</td>
<td>0.003</td>
</tr>
<tr>
<td>Sr-90</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Tc-99m</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>U(Nat)</td>
<td>Unlimited</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Th(Nat)</td>
<td>Unlimited</td>
<td>Unlimited</td>
</tr>
</tbody>
</table>
Figure 1 Decision Flow for Package Type
7.2.4. Type B packages

Type B packages are required for the transport of higher levels of radioactive material. These packages must withstand the same normal transport conditions as Type A packages, but because their contents exceed the Type A limits, it is necessary to specify additional resistance to release of radiation or radioactive material due to accidental damage.

7.3. Documentation

The following documentation is required for transport of radioactive material by road:

- Movement order (e.g. consignment note and chain of custody);
- Details of the consignment (including radionuclide, total activity, number of packages);
- Class 7 Dangerous Goods Shippers Declaration (one copy to be retained by the consignor, two copies to go with the driver, one of which is to be handed to the consignee), refer to:
  - A copy of the manufacturer’s source certificate, confirming special form status, for each radioactive source;
- Any supplementary information for carriers (e.g. additional handling requirements, emergency arrangements, restrictions on loading).

All documentation must be correctly completed, dated and signed by an authorised and appropriately qualified person.

Additional documents for transport of radioactive material by sea:

- AMSA Multimodal Dangerous Goods Form, in accordance with the current IMDG Code.

It is the responsibility of the consignor to ensure that the required documents are provided and correctly completed, dated and signed by a competent person.

Note: Additional training and licensing approval is required to consign or oversee the transport of radioactive material by sea.

7.4. Labelling and Placarding

Labelling for packages will be classified into one of the following classifications:

- Excepted Package;
- Category I White;
- Category II Yellow; or
- Category III Yellow.

Classification is based on external dose rate, measured at the surface and at a distance of 1m from package surfaces. Each package is assigned a Transport Index which assists in the determination of classification.

The Transport Index is a function of dose rate from the package. It is determined by taking the maximum of all dose rates measured at 1m (in μSv.h⁻¹) from surfaces of a package using suitable, calibrated monitoring equipment. The measured value is divided by 10, and then multiplied by the appropriate Area Multiplication Factor (AMF) to determine Transport Index.

\[ TI = \left[ \frac{(\text{Max Dose Rate at 1m (μSv)/(h)}) - 10}{\text{AMF}} \right] \]
The AMF is a value that is based on the largest cross-sectional area of a load, and values are listed in the below table.

Table 8 - Extract from Transport Code [3] – MULTIPLICATION FACTORS FOR TANKS, FREIGHT CONTAINERS AND UNPACKAGED LSA-I AND SCO-I

<table>
<thead>
<tr>
<th>Size of load a</th>
<th>Multiplication factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>size of load ≤ 1 m²</td>
<td>1</td>
</tr>
<tr>
<td>1 m² &lt; size of load ≤ 5 m²</td>
<td>2</td>
</tr>
<tr>
<td>5 m² &lt; size of load ≤ 20 m²</td>
<td>3</td>
</tr>
<tr>
<td>20 m² &lt; size of load</td>
<td>10</td>
</tr>
</tbody>
</table>

a Largest cross-sectional area of the load being measured.

A decision flow, such as presented in Figure 2 may be useful to determine the type of label to be used on a package.
Figure 2 Decision Flow for Classification of Packages
7.4.1. Labelling of Excepted Packages

Excepted packages are generally those containing material with total activity and activity concentration less than the limits given by Table 3 of the Transport Code [3] and having a surface dose rate of less than 5 µSv.h⁻¹. They do not require external labeling declaring radioactive material as contents. Requirements and controls for transport of excepted packages are described in paragraphs 515–520 of the Transport Code [3].

In summary, the labeling requirements for excepted packages are as follows:

- The consignment note must refer to the material with the correct UN number (e.g., UN2910, UN2911, etc)
- The outside of the package must be marked with the correct UN number and the consignor or consignee’s details; and
- There must be a warning sign on the inside of package, which is clearly visible upon opening, saying “Caution – Radioactive Material”;
- Packages of gross mass greater than 50 kg shall have the mass durably marked on the outside of the package.

7.4.2. Category Labels (I White, II Yellow & III Yellow)

For packages containing material that exceeds the limits for excepted packages, and/or with a surface dose rate greater than 5 µSv.h⁻¹, the package category is determined by the Transport Index and the surface dose rate. All categories of package (other than excepted packages) require appropriate labels that must be affixed to the package indicating the category and contents (radionuclides) and activity. Label types are shown below.
Transportation of any package that is classified as Category I White, Category II Yellow or Category III Yellow requires the following:

- Package dimensions must be sufficient to enable labels of size 100mm x 100mm to be affixed to two opposite sides;
- Package must be labelled, on two opposite sides with ‘Dangerous Goods Class 7, Radioactive, Category I, II, or III’ labels;
- Packages of gross mass greater than 50 kg shall have the mass durably marked on the outside of the package.

### 7.4.3. Vehicle Placarding

Vehicles must be placarded on both sides and rear with 250mm square DG Class 7 placards (see example below); and

![Figure 5 Example of Radiation Placard](image)

### 7.5. Loading and Checking

The following aspects should be incorporated into procedures for packaging of radioactive material, loading vehicles and checking packages prior to transport:

- Only personnel with current and appropriate training/induction should be involved in dealings with radioactive material;
- Package labels must be checked and confirmed against the manifest to verify that both the labeling and manifest accurately describe the contents of the package;
- Package dose rates must be checked and confirmed against the Transport Index value recorded on the package label;
- Consignors declaration must be checked to confirm that details of the transport are recorded correctly;
- Packages that contain radioactive material must be securely stowed, (i.e. packed in the vehicle so that they will not shift during transport), away from heavy goods which might damage the package during transport and in such a way that the package does not project from the confines of the vehicle;
- Packages must be secured such that they cannot be easily removed from the conveyance by mistake or intentionally (i.e. stolen);
- Packages should be stowed as far away as practicable from the driver and other occupied positions;
- Category II and III packages are not to be stored in passenger compartments and only the driver and their assistant(s) may accompany such packages; and
There are multiple methods for application of dose constraint – one method for involves a calculated limit of 2 μSv/h at occupied positions in the vehicle, based on the 1mSv (1000μSv) per year limit and an estimate of 500 driving hours per year.

Except for a consignment transported under exclusive use, the radiation level under routine conditions of transport may not exceed 2 mSv/h at any point on, and 0.1 mSv/h at 1m from, the external surface of the conveyance;

Any package or overpack, having a TI greater than 10 shall be transported under exclusive use.

Additional requirements are detailed by the Transport Code [3], as referenced by the Regulations.

### 7.6. Segregation and Storage in Transit

In general, packages containing radioactive material may be transported – or stored in transit – with other packages, within the limitations imposed by the Transport Code [3] and the ADGC.

The Transport Code [3] requires segregation of packages containing radioactive material from workers, members of public, food and undeveloped photographic film such that dose or dose rate limitations are observed.

Segregation from other classes of Dangerous Goods may also be required under the ADGC, or due to subsidiary risks associated with physical or chemical properties of the material.

#### 7.6.1. Transport of Radioactive Material with Other Goods

Radioactive material may be stored and transported with other goods, within the following guidelines:

- Doses to workers and members of the public do not exceed regulatory limits described in Table 3;
- Transport or storage of radioactive material with other “Dangerous Goods” must be compliant with the requirements for segregation under the ADGC;
- Radioactive material may be transported or stored with undeveloped photographic film provided that the film is not exposed to greater than 0.1μSv;
- Storage and transport with other goods is not permitted where the radioactive material is being transported under the exclusive use provisions of the Transport Code [3];
- Radioactive material may not be transported with foodstuffs.

Table 9 lists the substance codes that may be transported with radioactive material.

**Table 9: Classes of substances that may be transported with radioactive materials**

<table>
<thead>
<tr>
<th>Non-flammable Non-toxic gas (2.2)</th>
<th>Toxic gas (2.3)</th>
<th>Toxic substances (6)</th>
<th>Miscellaneous DG (9)</th>
</tr>
</thead>
</table>

Those codes that are not allowed to be transported with radioactive material are listed in Table 10.
7.6.2. Transport of Radioactive Material with other Radioactive Material

Packages containing radioactive material may be transported together, although limits are in place based on the sum of Transport Indexes for all packages being transported or stored together. The sum of all TI's in one location shall not exceed 50.

If these limits are exceeded, the Transport Code [3] provides for transport under exclusive use, or transport under special arrangement may be negotiated with the regulator. Any package or overpack having a TI greater than 10 shall be transported under exclusive use.

Further limits relating to Transport Indexes can be found in Table 11.
8. Communications

Any vehicle transporting radioactive material under this RPP will be carrying appropriate means of communication to enable contact between the transportation vehicle and the responsible person/RSO, emergency services and/or the relevant Regulatory Authorities.

[HOLD 9: communication] Communication may include mobile telephone, UHF radio, satellite telephone or any combination of the above. It is recommended that at least two separate means of communication are available. If the transport route is likely to go outside mobile communication range, a portable satellite telephone shall be carried in the vehicle.
9. Emergency Contacts

A list of contact telephone numbers for key personnel and agencies is provided below. Depending on the nature of the incident or accident, notification to or engagement of other personnel or agencies may be required.

Table 12 Emergency Contact Information

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Contact (Role)</th>
<th>Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAZRAD Australia Pty Ltd</td>
<td>Samuel Jackson</td>
<td>0413 253 558</td>
</tr>
<tr>
<td>Department of Fire &amp; Emergency Services</td>
<td>Emergency Calls</td>
<td>000 9395 9300</td>
</tr>
<tr>
<td></td>
<td>General business</td>
<td></td>
</tr>
<tr>
<td>WA Police</td>
<td>Emergency Calls</td>
<td>000 131 444</td>
</tr>
<tr>
<td></td>
<td>General business</td>
<td></td>
</tr>
<tr>
<td>Radiation Health/ Radiological Council</td>
<td>Regulator / Emergency Calls</td>
<td>(08) 9388 4999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(08) 9346 3333 ah</td>
</tr>
<tr>
<td>Radiation Safety Officer</td>
<td>Simon Booth – Senior RPA</td>
<td>0417 966 438</td>
</tr>
</tbody>
</table>

Contact details for competent authorities in all states and territories of Australia are appended to the Transport Code [3].

10. Incident/Accident/Emergency Preparedness & Response

This section provides a summary of preparedness and response measures for incidents or accidents involving radioactive material.

Dangerous Goods – Initial Emergency Response Guide Handbook (HB 76:2010) provides emergency response information for dealing with accidents, spills, leaks or fires involving dangerous goods. Guide 43 has information on radiation hazards, and has information on protective clothing and emergency procedures for low level radioactive materials. This Handbook may be used for initial emergency response to incidents involving the transport or in-transit storage of dangerous goods (as listed in ADGC).

All personnel involved in the transport of radioactive material (drivers, loading and handling personnel etc.) are to be instructed in response measures for an incident or accident involving radioactive material. Refresher training should be provided to personnel after a period of 12 months, or after a significant break from duties involving radioactive material.

Emergency guidelines are to be printed and provided to drivers to accompany each transportation of radioactive material. These guidelines will include contact details for all persons or agencies to be informed in the event of an incident/accident (including emergency services, the competent authority, RPP manager and/or consignor emergency contact, consultant radiation specialist/RSO and any other relevant agencies e.g. port authority etc.). Basic information on response measures must also be included in the emergency guidelines.

The Radiological Council shall be informed of all incidents/emergencies immediately, and a written incident report be submitted within seven (7) days of the incident. An incident report template can be found at:

Investigations and reports shall assess and/or estimate possible dose exposure to personnel and shall specifically address:

- Doses received;
- The causes of the incident;
- The consequences of the incident;
- Steps taken to remediate the situation; and
- Changes implemented to prevent recurrence of the situation.

10.1. General Response Measures:
As with any incident or accident, first responders should:

- Ensure that they do not place themselves in danger;
- Take any necessary steps to preserve life, unless doing so would place themselves or others in danger;
- Take any necessary steps to control immediate hazards including fire, using available response equipment if it is safe to do so;
- Restrict access to the immediate vicinity to minimise the potential for escalation;
- Call for appropriate assistance (including emergency services);
- Render care to any person injured or otherwise affected by the incident/accident, unless doing so would place themselves or others in danger;
- Where possible, protect property unless doing so would place themselves or others in danger;
- Where possible, protect the environment unless doing so would place themselves or others in danger;

Summaries below include measures that are specific to incidents or accidents involving radioactive material. These measures may be incorporated into first response advice to accompany conveyances.

10.2. Undeliverable Consignment:
Retain custody of the package – packages are not to be delivered or left unattended if the consignee (or a representative) is not present to take delivery of it;

If a consignment is undeliverable (after making reasonable efforts to contact the consignee), it must be kept in a safe location and the competent authority must be contacted to request further instructions. Contact with the Radiological Council should be made in accordance with HAZRAD Services’ chain of command.
10.3. Damage to a Package Containing Radioactive Material (no other emergency aspects):

- Restrict access to the area to prevent spread of any possible contamination;
- Consult transport documentation to determine nature of package contents;
- Inform RPP Manager or consignee emergency contact, who will:
  - Seek specialist advice as appropriate (RSO or Radiation Professionals);
  - HAZRAD Services personnel are ONLY trained to deal with undamaged packages – should a package be compromised; the owner of the devices/sources should be consulted for remediation advice;
  - Inform the competent authority (via HAZRAD Services’ chain of command) if and as required under legislation;
  - Arrange for monitoring of the package, vehicle and surrounding area;
  - Arrange for decontamination of the package, vehicle and surrounding area if necessary;
  - Arrange for repair to packaging or repackaging, so that transport may be completed;
  - Ensure that an incident report is lodged as per HAZRAD Services’ standard protocols and that the incident is investigated, identifying cause, remedial actions and preventative measures to prevent recurrence;
  - Do not handle the damaged package, unless directly instructed to do so by the radiation specialist or competent authority;
  - If there is visible loss of containment, and if possible, minimise the spread of any spillage by using spill control equipment taking care not to contact the material or spread contamination further.
  - Inform transport services provider, so that they can accommodate the delay;
  - If any person has touched the damaged package, they should not eat, drink, smoke, or touch their face until they have been decontaminated and/or checked for possible contamination.

Do not handle the damaged package, unless directly instructed to do so by the radiation specialist or competent authority;

10.4. Road Accident Involving a Vehicle Transporting Radioactive Material:

- Adhere to the general advice given above;
- Promptly inform emergency services of the nature of the incident/accident, specifically advising that the incident/accident involves radioactive material (details of the type and quantity of material will be available on the transport documentation – Class 7 Shipper’s Declaration);
- Consult transport documentation to determine nature of package contents and emergency response measures;
- Do not attempt to clean up or in any way handle the damaged package(s) or materials or spilled material unless instructed by the RSO or competent authority;
- Evacuate the area to a safe position upwind (15m) and away from any other potential sources of danger e.g. traffic. Cordon off the area to restrict traffic and potential spread of any contamination;
- Inform RPP Responsible Person or consignee emergency contact, who must:
  - Inform the competent authority (via ‘s chain of command as soon as possible;
  - Seek specialist advice as appropriate (RSO or Consultant Radiation Specialist);
  - Engage with emergency services to ensure effective response including:
    - Monitoring of the package, vehicle and surrounding area;
    - Recovery of any spilled material or loose objects;
    - Decontamination of the package, vehicle, surrounding area and any persons;
    - Remediation of the area.
• If contact cannot be made with the RPP Responsible Person or consignor emergency contact immediately, the first responder must inform the statutory RSO whom will then be responsible for informing the competent authority directly;
• Identify persons, vehicles, equipment or items which may have been contaminated or exposed to radiation, and ensure that they remain at the scene
• If possible, minimise the spread of any spillage by using spill control equipment, taking care not to contact the material or spread contamination further;
  • Engage and cooperate with emergency services personnel (usually via the Incident Controller or Lead Agency representative) to inform them of:
    • Details of the type and quantity of radioactive material involved
    • Details of any person(s), vehicles, equipment or items which may require decontamination;
• Contact relevant agencies and personnel e.g. competent authority
• Maintain communication with key personnel and agencies via telephone, UHF etc.
• If any person has touched the damaged package, they should not eat, drink, smoke, or touch their face until they have been decontaminated and/or scanned with a contamination monitor to ensure that they will not risk transferring or ingesting material.

10.5. Excessive dose
In addition to standard procedures outlined above, should it become apparent/suspected that personnel have become accidentally exposed to radiation from a radiation device on site, or have received a dose greater than those specified in Table 4, the following procedure/investigation is to be undertaken:
1. Move the person away from all radiation sources and isolate area surrounding the suspected device, if possible.
2. Notify Responsible Person and RSO (or deputy RSO) immediately.
3. Barricade suspected device
4. If a personal radiation monitoring device was worn, in the case of a:
   a. TLD/OSL – send away for urgent analysis
   b. PED – read exposure from radiation device.
5. RSO to interview all personnel involved in the incident, trying to ascertain how the exposure happened, what procedures were/were not followed, before approaching suspected radiation device.
6. Estimate dose received using knowledge of 1m dose rate for that particular radiation device, distance personnel were from the radiation device and estimated time personnel spent in the field (Dose = dose rate x time)
7. Seek further expert advice from Service Provider or RCWA if required.
8. If deemed necessary, send personnel for further medical checks.
In the event that overexposure of personnel, the RSO will carry out an investigation to determine the likely dose that has been received. In the case of an intake of radioactive material the RSO must make an estimate of the likely quantity of material involved and contact the RSO for further assistance.
The potential dose should be calculated on the basis of the maximum dose rate that the individual was exposed to and the duration of the exposure.
If the investigation shows that the individual has exceeded a dose limit or it cannot be proved otherwise, then the Responsible Person must be notified immediately and the RCWA must be notified – see Table 4 for further information on dose limits.
10.6. HAZMAT
The designated Hazard Management Agency for any incident in Western Australia involving a spill of material on public roads/rail is the Department of Fire and Emergency Services (DFES).
At a state level, the HAZMAT Emergency Advisory Team (HEAT) coordinates government and private stakeholder agencies to ensure participatory development of procedures and uniform response to HAZMAT incidents. HEAT provides operational support to DFES throughout the initial response until the site is declared safe and responsibility is returned to DFES and relevant government agencies to ensure complete restoration of the site and removal of any hazardous materials for safe disposal.

10.7. Security
[HOLD 2]
The sources HAZRAD Services will be transporting, may be classified as Security Enhanced Sources (SES) by the Security Code (RPS 11). An assessment of the sources (or aggregate of sources) being transported MUST be assessed for each consignment prior to transport commencing.
Methodology of source assessment is outlined in HAZRAD's Source Security Plan (SSP). Should it be determined that a consignment is classified as Security Enhanced, the SSP details the requirement to generate a Source Transport Security Plan (STSP).
All persons involved in the transport and storage of SES, shall make themselves familiar with the requirements of the HAZRAD Services STSP.
For non-SES, general security measures should be implemented to ensure that unauthorised personnel do not take possession (by accident or deliberately) of any package containing radioactive material.

11. Training
The HAZRAD RSO and people taking responsibility for the transport of radioactive material are required to hold a licence for the purpose of ‘transport’ under the Radiation Safety Act. The pre-requisite training courses for this licence category are listed on the Radiological Council of Western Australia (RCWA) website.
All persons engaged in the transport of radioactive material or associated activities (including classification, packing, marking and labelling, offering or accepting material for transport, carrying or handling material in transport, marking or placarding or loading material into or from transport vehicles, preparing transport documents or other involvement) must receive training that is appropriate to their role, and commensurate to the risk associated with their duties (Code 312 – 313).
Training should also include regulatory aspects to a depth that is commensurate to the responsibilities associated with each role.
Topics to be covered in training are:
• Ionising Radiation:
  • Basic awareness of the properties of ionising radiation
  • Biological effects of radiation and radiation units
  • Understanding dose and the important distinction/relationship between unit prefixes (especially 1000 µSv = 1 mSv)
  • Radiation dose limits
• Managing the Radiation Hazard:
  • Principles of protection – internal and external
  • Work practices and operational procedures to minimise exposure risk
  • Correct use of PPE
• Radiation Monitoring:
  • General monitoring requirements
  • Use of personal monitors
• Regulatory Control of the Transport of Radioactive Material:
  • Basic awareness of/familiarity with applicable regulatory framework
  • Overview of categories of radioactive material, labelling/marketing/placarding/packaging/segregation
  • Requirements, required transport documentation and emergency response documentation;
  • Roles and responsibilities of personnel including the RSO.
• Function Specific Training:
  • Transport requirements specific to the function that each person performs;
  • Transport Safety (commensurate to exposure risk):
    • Accident avoidance (correct stowage, proper handling techniques);
    • Incident/accident/emergency response documents;
    • General dangers presented by various classes of radioactive material, and how to prevent/minimize exposure;
    • Immediate procedures for any spill or release of radioactive material, including emergency response procedures.

In addition to the above, all personnel (employees and contractors) shall be informed of the following controls relating to the transport of radioactive material:
• Be aware of risks of subsidiary hazards associated with the package/material (explosiveness, chemical toxicity, flammability, corrosiveness etc). This must be taken into account with regard to packaging and all stages of the transport;
• Where a consignment is undeliverable, the consignment shall be placed in a safe, secure location and the Radiological Council called to request further instructions;
• A “Consignor’s Declaration for Dangerous Goods – Class 7 Radioactive Material” must be completed, one copy to stay with the consignor and two to go with the carrier (one to be given to the consignee);
• The Package must be designed/constructed such that it retains its radioactive contents under routine transport conditions;
• The Package must be able to be properly secured and shall be securely stowed during transport;
• There must be NO non-relevant labels or placards, except for additional dangerous properties as required, on the surface of the package;
• The radiation and contamination levels from/on the package shall be kept as low as practicable AND below regulatory limits;
• During loading, transport, storage or in transit storage, if a package is found to be damaged or leaking then access must be restricted until a qualified person can assess the extent of contamination and the radiation levels around the package. If necessary (to avoid further damage or restrict public exposure), the package may be removed to an interim location, but it MAY NOT be forwarded until repaired and rechecked.
Function specific training (for driver(s) and assistant(s), persons involved in packaging material, persons involved in loading/offloading material etc.) may cover aspects of transport including:

- Completion of transport documents;
- Preparation of packages;
- Measurements of dose rate and Tl;
- Contamination clearance;
- Completion and application of package labels;
- Loading of packages on to the vehicle;

Persons required to hold a license/certification for the transport of Radioactive Material should renew their licenses and training as required by the Appropriate Regulatory bodies.

12. Review

This RPP will be reviewed and updated as necessary to reflect any changes in the scope of proposed transport activities undertaken by, or other organisational procedural or personnel changes.

Routine evaluation will ensure that the RPP remains compliant to current legislation, and that transport of radioactive material is being undertaken in a safe and controlled manner, aligned to the wider objectives of the’s safety management objectives.

At a minimum, this RPP should be reviewed Annually.
13. References


[5]. ARPANSA RPS C1, Planned Exposure Code (2016)

[6]. ARPANSA RPS F1, Fundamentals for Protection Against Ionising Radiation (2014)

[7]. WA State Law Publisher Radiation Safety Act (1975)

[8]. WA State Law Publisher Radiation Safety (General) Regulations (1983)


14. Glossary

Activity: Amount of radioactive material in a sample, measured in Becquerels, where 1 Bq = 1 atomic decay per second.

ALARA: As Low As Reasonably Achievable, social and economic circumstances being taken into account.

AMSA: Australian Maritime Safety Authority

ARPANSA: Australian Radiation Protection and Nuclear Safety Agency

Becquerel / Bq: Unit of Activity see above; named after the discoverer of natural radioactivity.

Carrier: An individual or organisation transporting radioactive material.

Consignor: An individual or organisation who prepares a consignment of radioactive materials for transport, and who is named as consignor in the transport documents.

Consignment: A package, or load of radioactive material, which is presented by a consignor for transport.

Designated Radiation Worker: means radiation worker designated by a registrant, a radiation safety officer or the Council as having an occupational radiation exposure with the potential to exceed the effective or equivalent dose limits.

Dose: may be absorbed dose, committed dose, equivalent dose, or effective dose.

Gamma radiation: electromagnetic radiation like x-rays, emitted from the nucleus of an atom.

IAEA: International Atomic Energy Agency

IMDG: International Maritime Dangerous Goods Code

ICRP: International Commission on Radiological Protection

LSA: Low specific activity material such as scale or sludge containing uranium and thorium ores, and other others containing naturally occurring radioactive radionuclides which are intended to be processed for the use of these radionuclides.

NORM: Naturally Occurring Radioactive Material

Member of Public: not occupationally exposed to radiation. Occupational Dose – total dose minus the background dose.

Package: The packaging together with its radioactive contents as presented for transport.

PED: Personal Electronic Dosimeter, used for personal dose measurement

PPE: personal protective equipment e.g. dust masks.

Radiation Worker: means a worker who may be exposed to radiation in their workplace as a direct cause of their work.

Radionuclide: also radioisotope, a radioactive form of an element

RPP: Radiation Protection Program

SCO: Surface contaminated object such as a solid object which is not itself radioactive but which has radioactive material distributed on its surfaces

SEC: Security Enhances Source
Sievert / Sv

Unit of effective dose.

SSP

Source Security Plan

STSP

Source Transport Security Plan

TLD Badge

Thermo-luminescent Dosimeter, personal radiation badge, records time-integrated gamma dose.

UNSCER

United Nations Scientific Committee on the Effects of Atomic Radiation

Wipe tests

test done with alcohol swab or glass fiber filter disc and analysed for contamination.

All other definitions are as per the Radiation Safety Act WA, Radiation Safety Regulations WA and the Transport Code [3].