

Transport of radioactive material

February 2023

EPA 1131/23: The purpose of this document is to provide guidance to potential holders of a licence to transport radioactive material to undertake this activity in compliance with the Radiation Protection and Control Act 2021.

1 Scope

This guidance document highlights the requirements of section 21 of the *Radiation Protection and Control Act 2021* (RPC Act) and Regulations 15, 111, 112 & 113 of the *Radiation Protection and Control Regulations 2022* (RPC Regulations) and has been informed by consultation with industry on the staged implementation of new requirements in the legislation.

In line with other Australian jurisdictions, the RPC Act introduces licencing of the transport of radioactive material and adopts the national ARPANSA *Code for the Safe Transport of Radioactive Material* (Transport Code). This document lists key activities considered part of transporting radioactive material, operations which require licensing, packages (including naturally occurring radioactive material or NORM activity levels) and carriage which does not require licensing; along with elaborating operations which are considered high risk and require more stringent controls.

Additional information on training, radiation management plans (RMP), incident management and response, best practice measures and labelling are detailed in appendices.

2 Prior legislation

The repealed *Radiation Protection and Control Act 1982* was regulating radioactive substances in South Australia and the *Radiation Protection and Control (Transport of Radioactive Substances) Regulations 2018* covered responsibilities for consignors, carriers and drivers involved with transporting radioactive substances.

3 Current legislation

- [Radiation Protection and Control Act 2021](#) (RPC Act)
- [Radiation Protection and Control Regulations 2022](#) (RPC Regulations)
- [Code for the Safe Transport of Radioactive Material](#) (Transport Code), Radiation Protection Series C-2 (Rev.1), published by ARPANSA in 2019, as modified by Schedule 6 of the Radiation Protection and Control Regulations 2022
- [Code of Practice for the Security of Radioactive Sources](#) (Security Code), Radiation Protection Series No. 11, published by ARPANSA (2019)

4 Transport

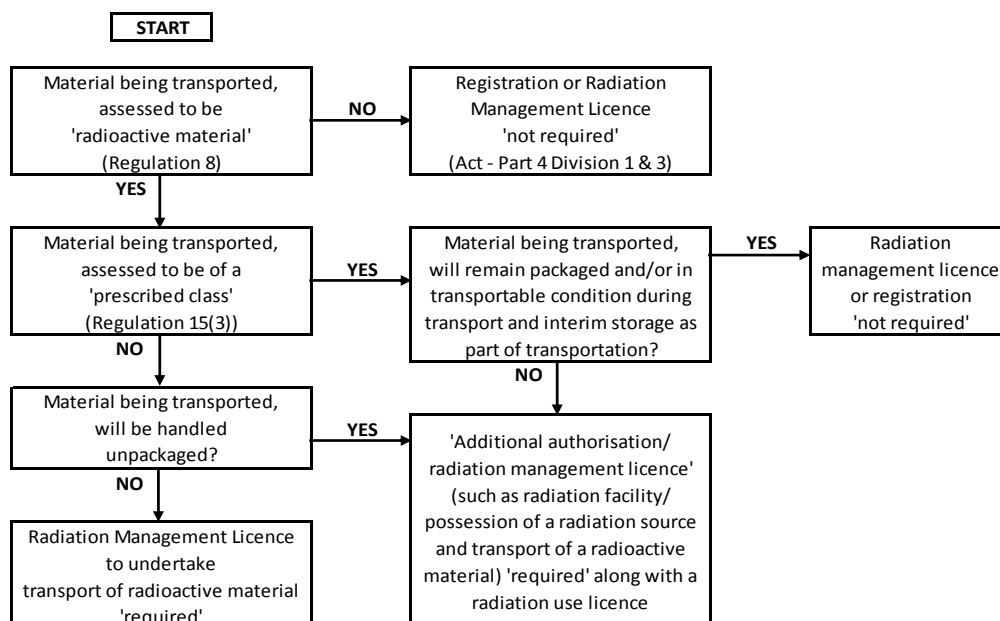
Transport comprises all operations and conditions associated with, and involved in, the movement of radioactive material. These include the design, manufacture, maintenance and repair of packaging, and the preparation, consigning, loading, carriage (including in-transit storage), shipment after storage, unloading and receipt at the final destination of loads of radioactive material and packages.

Carriers/consignors undertaking the following tasks are deemed by the regulations as responsibilities of those involved in transport of radioactive material:

- classifying radioactive material to be transported
- packing or unpacking of radioactive material
- marking or labelling of radioactive material
- marking or placarding of packages of radioactive material and vehicles carrying radioactive material
- consigning of radioactive material for transport
- loading/unloading of packages of radioactive material
- carrying or handling of radioactive material in transport
- storage of radioactive material during the course of or in connection with its transport
- preparation of transport documentation for radioactive material
- driving of vehicles transporting radioactive material
- maintenance of vehicles or equipment used in transport of radioactive material
- acceptance or receiving of a consignment of radioactive material.

5 Licence

A radiation management licence authorising the transport of radioactive material (see flowchart) is required when transporting radioactive material by road, rail and inland waterways, under the jurisdiction of South Australia. Transport of radioactive material by air or sea is regulated by Civil Aviation Safety Authority and Australian Maritime Safety Authority respectively. Transport of radioactive material such as uranium may also require a permit from the Australian Safeguards and Non-Proliferation Office.



Flowchart showing licence requirement to undertake transport of radioactive material

The RPC Regulations do not require most transport operations to attain additional 'possession authorisation' or 'registration of premises in which unsealed radioactive material is handled or kept'. However, additional authorisation may be required for certain activities, which are not classed as an activity undertaken for transport purposes only (unless otherwise permitted by the Regulation or a gazette notice), such as:

- 1 An operation where unsealed radioactive material is handled or kept unpackaged and the total activity of material exceeds the level defined in Regulation 7(f), 7(g) or the dose criteria in 7(h).
- 2 An operation where radioactive material is stored for interim purposes (while awaiting transportation to the end user/ consignee) and/or where an undelivered radioactive consignment is stored; in the same location for more than five (5) consecutive days (unless otherwise approved by the Minister); in uniformity with National Standard [NOHSC:1015(2001)] and the South Australian *Work Health and Safety Regulations 2012*.
- 3 An operation where sealed radioactive sources are handled unpackaged (eg transfer between transport containers).

Transport of security enhanced sources i.e. Category 1, 2, 3 (or a similar activity ratio aggregate of sealed radioactive sources) would need additional requirements to be fulfilled by the carrier, including:

- 1 submission of a Source Transport Security Plan (as per Schedule A2 of Security Code) endorsed by an approved assessor, at least seven (7) days prior to movement of this source to the EPA
- 2 identity/background security check for the driver transporting this source

Further details on security of sealed radioactive sources is available through the 'Security Code' and [Guidance document - Security of sealed radioactive sources](#)

For transportation within South Australia, the following radioactive material/packages do not need licensing:

- excepted packages
- radioactive material that is an integral part of the means of transport (such as thorium alloy in an engine of the vehicle)
- radioactive material moved within an establishment (which is subject to enforced safety regulations) and this movement does not involve public roads or railways
- radioactive material contained within the body of a person or animal (whether living or dead)
- radioactive material in or on a person, being transported for medical treatment because the person has been subject to accidental or deliberate intake of radioactive material or to contamination
- radioactive material in consumer products that have received regulatory approval (Schedule 4 of the Regulations), following their sale to end user
- natural material or ores containing naturally occurring radioactive material/NORM (which may have been processed), provided the activity concentration of material does not exceed 10 times the value specified in Table 2 or as detailed in clause 107(f) of the Transport Code
- non-radioactive solid objects with non-fixed radioactive contamination present on its surface (averaged over an area of 300 cm²) in quantities not in excess of 4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 0.4 Bq/cm² for all other alpha emitters (Transport Code clause 508).

Some of the above classes of consignments are still subject to obligations in the RPC Regulations and Transport Code which the consignor and carrier must comply with.

For example, business (carrier) undertaking transportation of natural material or ores containing NORM with an activity concentration less than 10 times the value specified in Table 2 or as detailed in clause 107 (f) of the Transport Code; would not trigger the requirement to obtain a 'radiation management licence' to transport radioactive material. However, during this operation, the material packaging must not be interfered with or wrongfully handled; which would make it deemed as unsafe for transportation.

It must be noted that if material in the above example is stored in the same location for more than five (5) consecutive days by the carrier; then as per Regulation 19(1)(a), that location would not be considered prescribed anymore and the carrier must apply for registration of that premise where unsealed radioactive material is handled or kept.

6 Responsibilities

The prime responsibility for safety in regard to transport of radioactive material rests with the person or organisation responsible for the facilities and/or activities undertaken, that give rise to radiation risks. Each party involved in the radioactive material transportation chain of command, is responsible to ensure safety protocols have been addressed and adhered to as outlined in the relevant legislation.

Carrier (defined in the RPC Act and Transport Code) – must ensure that during the course of transport of radioactive material in a freight container or on a vehicle, each package is stowed in such a manner that the package remains in position at all times; despite movements involving starting, stopping, jolting or swaying, to which the vehicle is subject to. The package must be kept away from heavy articles or goods likely to damage the package in the usual course of transport and that the package must not project beyond the periphery of the vehicle.

Consignor (defined in Transport Code) – is required to provide a consignor's declaration, other transport documentation and must ensure the material/source is appropriately packaged for transport. Consignors who are consigning a security enhanced source have additional responsibilities as detailed in the Security Code.

Driver – of the vehicle must follow legislative requirements and any internal procedure regarding transport of radioactive material. Driver must report on package details, accidental circumstances, interference, or potential leakage to all relevant personnel if the package is lost, wrongfully interfered with (contents, labelling/markings or documentation), damaged or the radioactive material has leaked from the package. Driver of the vehicle must obey directions given by the Minister and prevent access to the package by anyone other than a person authorised to do so by the consignor, carrier or the Minister.

The responsible person of a business holding a radiation management licence to undertake the transport of radioactive material is accountable for provision of appropriate training to all personnel engaged by that business and for the submission of a detailed [radiation management plan](#) (RMP).

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Appendix A – Training requirements

Businesses that hold a radiation management licence for undertaking ‘transport of radioactive material’ need to provide training to all staff or other personnel engaged by that business in undertaking transport of radioactive material. The consignor, carrier (defined in the RPC Act and Transport Code) and any other person engaged under this radiation management licence must receive training on contents of the current legislation, internal business procedures, commensurate with their responsibilities, supervision in performing tasks safely and periodically supplemented with retraining at an agreed timeframe, detailed in the RMP. Records of such training undertaken must be kept by the employer [Regulation 111(6)].

Training shall be in accordance with Regulation 111 and should include (as relevant to the persons duties):

- familiarisation with the Transport Code
- responsibilities of the consignor, carrier and driver
- specific training as applicable to the task that the person has been employed or engaged to perform
- description of different categories of radioactive material and understanding of the consignment declarations
- description on the checks required before a radioactive consignment is accepted for transport
- information related to labelling, marking, placarding, packaging, limitations, segregation and content of transport documentation (Class 7 declaration/special form certificate of competent authority) of radioactive packages
- information on how the radioactive packages must be loaded and stowed in transport and interim storage
- procedures for use of over packs or freight containers
- description on how to identify potentially damaged or wrongfully interfered radioactive packages
- incident and emergency response procedures.

The training requirements in place at a business applying for a radiation management licence for transport of radioactive material, must be detailed with the RMP submitted as part of the licence application.

Appendix B – Radiation management plan (RMP) requirements

An application for a radiation management licence must include a radiation management plan (RMP) as specified in section 34(4) of the RPC Act. The RMP, also known as a *radiation protection programme* (in the Transport Code) shall incorporate requirements of clause 301, 303–305, 311 and 562 of the Transport Code. Detailed guidance on [Radiation Protection Programme](#) is available through the IAEA safety standards.

The RMP is owned by the licence holder and sets out how they will comply with their authorisation and the current legislation. The content of the RMP shall be related to the magnitude and likelihood of radiation exposures as part of the activity undertaken and should include:

- an operational overview (detailing licensed sites and/or security background checks in place)
- description of the management system for transporting radioactive material and in-transit operations; with an emphasis on optimisation of exposures, by inclusion of and adoption of a structured/ systematic approach
- responsibilities of the consignor, carrier and driver
- training requirements in place for workers and engaged contractors (see Appendix A)
- packages and categories of radioactive material (along with details on labelling, marking, placarding, packaging, segregation requirements, limitation to accept the consignment and content of transport documentation of radioactive packages) usually handled by the business
- safe transport practices in place; such as ensuring package integrity, segregation requirements, stowage during transport and storage in-transit as well as details on handling undeliverable consignments
- details on radiation exposure monitoring and record keeping (if exposures exceed 1 mSv/year)

- requirements for exclusive use consignments
- incident and emergency response provisions with procedural detail and liability to provide resources, so as to address such emergencies.

The RMP can be a standalone document or integrated into company operational documents and procedures. If the RMP is integrated into operational documents, an index should be prepared to demonstrate where each RMP requirement has been addressed.

Appendix C – Incident management and response

Consignors and carriers shall establish in advance arrangements for preparedness and response to potential incidents by identifying hazards, likely consequences, including other dangerous substances, in a consistent and coordinated manner. Provision of resources for incident prevention, management and control are to be detailed in the RMP submitted to the EPA, with the responsibility of each person within the business specified. As per Schedule 3 of the RPC Regulations, some incidents would require notification to the EPA and a few such notifiable incidents in relation to transport of radioactive material include:

- damage or loss of a package containing radioactive material during freight handling or transport
- transport of a package containing radioactive material without the documentation, placarding or labelling required by law
- unintentional or unauthorised discharge of radioactive material to the environment and/or an out of control radiation source
- contamination with or disposal of radioactive material
- damage to or malfunctioning of radiation apparatus or sealed radioactive source.

If a vehicle carrying radioactive material is involved in an incident, the consignor or carrier must give information about the properties of the radioactive material being transported, safe method of handling/containing/controlling the radioactive material. If directed by an authorised officer or emergency services officer, the carrier of radioactive material must provide information about the vehicle's construction, properties and equipment. The consignor or carrier must provide equipment and other resources required to control the situation, to contain, control, recover and dispose of the material and to recover the vehicle or its equipment.

Emergency planning and procedures should reflect the IAEA Safety Standard recommendations [Preparedness and response for a nuclear or radiological emergency involving the transport of radioactive material.](#)

Appendix D – Best practice measures for transport of radioactive material

Protection of people, property and the environment from harmful effects of ionising radiation during the transport of radioactive material could be achieved by:

- containment of the radioactive contents
- control of external dose rate
- ensuring radioactive material is kept secured in transport to prevent theft or damage
- segregation of radioactive material from other dangerous goods (in compliance with relevant legislation)
- prevention of damage caused by heat

The occupational exposure arising from transport activities is to be assessed, and if the effective dose is found to be between 1 and 6 mSv per year, workplace dose monitoring is to be undertaken. If the effective dose to workers is likely to exceed 6 mSv in a year, individual monitoring must be undertaken (Transport Code clause 303).

The EPA can undertake inspection of transport operations, which could be conducted during any phase of transport or storage in transit and may be announced or unannounced. EPA may request additional notification before a package is

shipped (certain high risk packages would require additional authorisation) or after it has been received to allow for certain inspections to be undertaken.

Control measures to consider when transporting radioactive material:

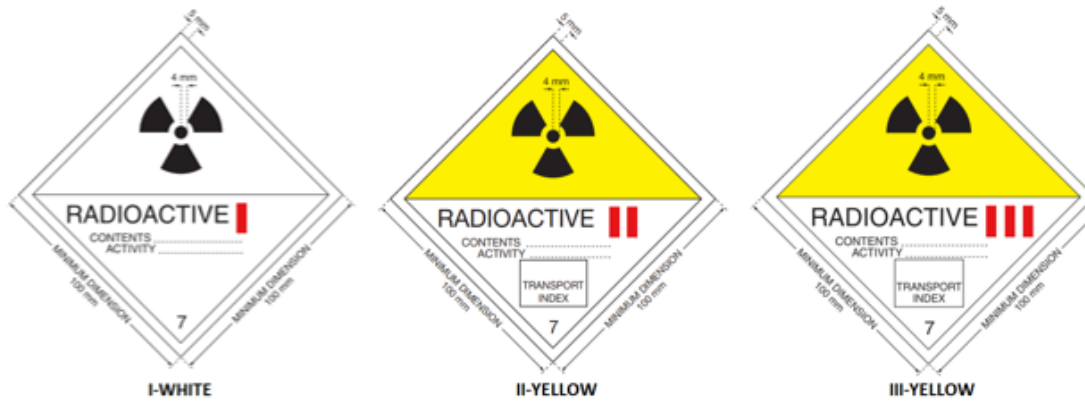
- 1 Consignments shall be securely stowed to prevent shifting or becoming damaged under normal transport conditions including restraint of segregation devices used for transport. The [NTC Load Restraint Guide 2018](#) provides guidance in regard to this requirement.
- 2 While transporting a radioactive source in a vehicle, the package must be located in the vehicle so that the radiation dose received by any person travelling in the vehicle is as low as reasonably achievable (ALARA).
- 3 If it is evident or suspected that a package is damaged or leaking, access to the package shall be restricted. The RMP should direct the response, which may include engaging an appropriately experienced person to assess the extent of contamination and resultant dose rate of the package. When required, additional steps shall be taken to overcome and minimise the consequence of such leakage or damage in accordance with provisions set by the EPA.
- 4 Damaged or leaking packages with contamination above the allowable limits for normal conditions of transport, shall be removed to an interim safe location and shall not be transported further until repaired, reconditioned, or decontaminated such that the package complies with the Transport Code.
- 5 If a source container is damaged, the RMP should direct the response, which may include engaging an appropriately experienced person to carefully examine the source container to verify its repair/ compliance in accordance with the relevant code and the approval to reuse the container to be received from the EPA prior to handling and reuse.
- 6 Any conveyance or equipment or other parts which in the course of transportation, has non-fixed contamination in excess of values specified in Transport Code clause 508; or the fixed contaminated in excess of 5uSv/h at the surface of the package; shall be decontaminated as soon as possible by a qualified person (Transport Code clause 513).
- 7 Segregation of packages from workers, members of the public, undeveloped photographic film and other dangerous goods which are incompatible with Radioactive Class 7 packages shall be maintained during transport and in-transit storage (Transport Code clause 562). For further details on dangerous goods incompatibility, refer to Table 9.1 of the [NTC Australian Code for the Transport of Dangerous Goods by Road & Rail, Edition 7.8, 2022](#) (ADG Code).
- 8 No person other than the driver and assistants shall be permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or III-YELLOW labels.
- 9 When a radioactive consignment is undeliverable, it shall be placed in a safe location and the EPA shall be informed as soon as possible (Transport Code clause 583).

The EPA has developed a specific [guidance document for the transport of uranium concentrate](#) however many aspects that apply to uranium concentrate are different for other types of radioactive consignments and packages.

Appendix E – Labelling on a radioactive material transport package

Common labelling, marking, placarding and documentation required for packaging and transporting radioactive material are:

- 1 **Labelling:** Prior to undertaking transportation of radioactive material, the transport index, criticality safety index and/or dose rate (as relevant) are determined for the package. On the basis of transport index and external surface dose rate values, packages are categorized and must be labelled as I-WHITE, II-YELLOW or III-YELLOW, as applicable (Transport Code clause 529)



- 2 **Marking:** Each package must be legibly and durably marked on the outside of packaging with the UN number, proper shipping name, the relevant package type (Industrial Package (IP), TYPE A, TYPE B(U), TYPE B(M) or TYPE C package design) or category of material contained (isotopes, LSA, SCO), an identification of either the consignor or consignee, or both and other details as required by Transport Code clause 546.
- 3 **Placarding:** Placards must be affixed in a vertical orientation to each outer side wall and to the outer end wall of the vehicle undertaking the transport of radioactive package as well as to the large freight container or tank containing radioactive material. Any placards that do not relate to the contents shall be removed. For further details regarding placarding requirements, refer to Chapter 5.3 of the ADG Code.
- 4 **Documentation:** Consignor must include transport documents, detailed in Transport Code clause 546 along with a duly signed and dated consignor’s declaration (Transport Code clause 547) with each radioactive material consignment.
- 5 Excepted packages do not require placards.

In order to demonstrate compliance with regulatory responsibilities, a carrier should not accept a radioactive consignment for transport unless a copy of transport document or other information as required by the Regulations has been provided by a competent person working under a ‘radiation management licence’ issued by the EPA.

Packages and UN numbers identifying hazardous radioactive material, when being transported, are as follows.

<p>Type A package (Clause 428 of Transport Code) UN 2915 UN 3327 UN 3332 UN 3333</p>	<p>Low specific activity material (Clause 408 of Transport Code) <u>LSA-I</u> UN 2912 <u>LSA-II</u> UN 3321 UN 3324 <u>LSA-III</u> UN 3322 UN 3325</p>	<p>Excepted package (Clause 422 of Transport Code) UN 2908 (Clause 427) UN 2909 (Clause 426) UN 2910 (Clause 424) UN 2911 (Clause 423) UN 3507 (Clause 425)</p>
<p>Type B (U) package (Clause 428 of Transport Code) UN 2916 UN 3328</p>	<p>Surface contaminated objects (Clause 412 of Transport Code) <u>SCO-I, SCO-II or SCO-III</u> UN 2913 <u>SCO-I or SCO-II</u> UN 3326</p>	<p>Rare shipments (not including Excepted package)</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Special arrangement (Clause 310 of Transport Code) UN 2919 UN 3331</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Uranium hexafluoride (Clause 420 of Transport Code) UN 2977 UN 2978</p> </div>
<p>Type B (M) package (Clause 428 of Transport Code) UN 2917 UN 3329</p>		
<p>Type C package (Clause 428 of Transport Code) UN 3323 UN 3330</p>		

Disclaimer

This publication is a guide only which does not necessarily provide adequate information in relation to every situation and is not a substitute for relevant legislation. This publication seeks to explain your possible obligations in a helpful and accessible way. In doing so, however, some detail may not be captured. It is important, therefore, that you seek information from the EPA itself regarding your possible obligations and, where appropriate, that you seek your own legal advice.

Further information

Legislation

Online legislation is freely available on <https://service.sa.gov.au/12-legislation>

General information

Environment Protection Authority
GPO Box 2607 Adelaide SA 5001
Telephone: (08) 8204 2004
Facsimile: (08) 8124 4670
Freecall: 1800 623 445 (country)
Website: <https://www.epa.sa.gov.au>
Email: radiationprotection@sa.gov.au
