

# Radiation Management Plan

## Booklet 8 - Transport of regulated material

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## 1. Background

To maintain a system of safe transport of radioactive material, the conditions in the Protection from Harmful Radiation Act 1990 No 13 (2023) and the Protection from Harmful Radiation Regulation 2013 (2023) must be met while transporting any radioactive material by road, rail, waterways, or air. For air travel, additional conditions in Civil Aviation Safety Regulations 1998 must also be met. The NSW regulation requires any transport of radioactive substance to be in accordance with the requirements of ARPANSA as published in 'Code of Practice for the Safe Transport of Radioactive Material: RPS Series C-2' which is also referred to as the Transport Code (2019). The Transport Code adopts the IAEA Specific Safety Requirements No. SSR 6, Rev 1 Regulations for the Safe Transport of Radioactive Material 2018 Edition. The Transport Code and the Radiation Control Act applicable at the time of reading should be consulted for the type, form and activity of the radioactive material not covered by this document.

## 2. Transport procedures

### Responsibilities

#### Responsible Person – Radiation Management Licence Holder

The Radiation Management Licence (RML) holder is responsible for ensuring that:

- All transport of radioactive material is done safely and according to legislation.
- Radioactive material is only transported with his/her authority.

#### Work Health and Safety Manager

In conjunction with the RSC and Technical Support Team, the Work Health and Safety (WHS) Manager will be responsible for maintaining a record of transport of radioactive material associated with CSU between suppliers, institutions, and facilities.

#### Radiation Safety Committee

The RSC is responsible for giving advice to all parties regarding the requirements for safe transport of radioactive materials.

#### The Consignor

The person initiating the transport of radioactive material (the consignor) is responsible for compliance with the current ARPANSA Code of Practice for the Safe Transport of Radioactive Material (RPS2).

## Radiation User Licence Holder

The person who requested the materials or who is transporting the materials as part of approved research or an approved teaching project must have a current radiation user licence.

## Procedure for Transport by Road

### NOTE:

The requirements for the safe transport of neutron gauges are included in *Section 17 - Safety with Neutron Gauges*.

CSU will adopt the transport guideline developed by NSW HURSOG for their members' use. The following is the complete document.

### GUIDELINES FOR THE TRANSPORT OF RADIOACTIVE MATERIALS BY ROAD BETWEEN HOSPITALS, UNIVERSITIES, RESEARCH AND OTHER MEDICAL ESTABLISHMENTS IN NSW

In these guidelines, the words "*shall*," "*should*" and "*must*" have the following meanings associated with them: *shall* – mandatory legal compliance, *should* – advisable, but not mandatory, *must* – although not legally mandatory, it is expected.

## Introduction

The Code of Practice specifies a classification of "Excepted Packages". Packages in this classification are exempt from many of the stringent requirements which otherwise must be followed.

If a package does not meet the "Excepted Packages" classification, then it must be transported as a "Type A" or "Type B" package. These latter packages must fulfil the detailed requirements of the Code of Practice. Those requirements are more stringent in that the package has to satisfy various performance tests, such as drop and penetration tests, to demonstrate an ability to withstand the normal conditions of transport. It is suggested that if a type A or type B package has to be transported, then the advice of the establishment's Radiation Safety Officer be obtained, or the Radiation Control Section of the NSW EPA should be contacted for directions.

The University's transport vehicle may be used to transport the package provided the driver has been instructed in how to handle and secure the package in the vehicle, and also in the actions to be taken in case of an accident or an emergency. Written instructions must also be provided (see the kit in [Appendix 22.2](#), below in this section).

For departments who may be regularly transporting radioactive materials, three placards should be made according to Figure 22.1 of [Appendix 22.1](#), and incorporated into the kit of [Appendix 22.2](#).

Packages with activities lower than those given in the "Exempt Activity" column, of Table 1 in [Appendix 22.1](#) are exempt from regulations. In NSW the "Activity" exempt from regulation is the "Prescribed Activity" of Schedule 1 of the NSW Radiation Control regulation 2013, and is listed in brackets in the same column of Table 1 in [Appendix 22.1](#). For compliance throughout Australia, the lower of the 2 values should be used.

[Appendix 22.1](#) contains relevant extracts from the Transport Code of Practice.

[Appendix 22.2](#) is a kit that may be used in conjunction with the Guidelines.

## Instructions for the Transport of All Packages

### Sender

- (a) All transportation of radioactive material must be approved in writing by the RSC prior to transport.

- (b) The material must be packaged appropriately:
  - (i) A liquid must be contained in a sealed labelled vial.
  - (ii) The vial or other source must be placed in a labelled shielded (lead etc) container with sufficient liquid absorber. The container will have a tight-fitting lid and be taped closed.
  - (iii) The shielded container will be placed in a secondary sealable container, packed well with cushioning material, and be labelled as "RADIOACTIVE" with the name of the material, activity of the compound, and the date.
  - (iv) The sealed container will be placed within an outer transport box with cushioning material to prevent movement within the box. The box must be sealed and labelled.
  - (v) The surface dose rate will be measured and recorded. Possible surface contamination must be checked by a wipe test.
  - (vi) Determine whether the package can be classified as an "Excepted Package". See Section 5 for excepted packages and Section 6 for non-excepted packages.
- (c) Fill in the "Dangerous Goods Declaration Form".
- (d) Label the package with the name and address of addressee. The package must also bear the sender's name and address.

#### Instructions to the Person Organising Transport

- (a) No taxis, motorcycles, or public transport may be used to transport radioactive material.
- (b) A courier should be used to transport the package whenever possible.
- (c) A University vehicle may be used to transport the package provided the driver has approval from WHS to transport such packages.
- (d) Written instructions about emergency procedures must be in the transport vehicle (see kit [Appendix 22.2](#)).
- (e) When the matter is urgent, private cars may be used (insurance provisions may apply). A person who is conversant both with the hazards involved and with handling emergency situations (preferably licensed to use the radioactive material being transported), must either drive the vehicle transporting the material, or must accompany the driver.
- (f) The package must be addressed and handed to a specific licensed person or their nominee. It must not be addressed generally to a "Department", nor delivered to some specified "area" or "front desk".
- (g) The person to whom the package is to be delivered should be advised of the time of despatch and expected delivery time.

### Excepted Packages

#### Instructions to Sender

- (a) The activity must be less than the value listed in Table 1 of [Appendix 22.1](#).
- (b) The radiation level at any point on the external surface must be less than **5  $\mu$ Sv/h**.
- (c) The removable radioactive contamination on any external surface must be less than **0.4 Bq/cm<sup>2</sup>**.
- (d) The package must bear the marking "RADIOACTIVE" on an internal surface in such a manner that a warning of the presence of radioactive material is visible on opening the package.

- (e) The consignor shall include in the Dangerous Goods Declaration Form with each consignment, the United Nations Number "2910", and for all items the proper shipping name and description of the substance or article being transported shall be included, i.e.:

**"RADIOACTIVE MATERIAL, EXCEPTED PACKAGE  
LIMITED QUANTITY OF MATERIAL"**

### Package Design

- (a) The package must retain its contents under conditions likely to be encountered during routine transport.
- (b) The package shall be so designed in relation to its mass, volume and shape that it can be easily and safely handled and transported. In addition, the package shall be so designed that it can be properly secured in or on the conveyance during transport.
- (c) As far as practicable, the packaging shall be so designed and finished that the external surfaces are free from protruding features and can be easily decontaminated.
- (d) As far as practicable, the outer layer of the package shall be so designed as to prevent the collection and the retention of water.
- (e) Any features added to the package at the time of transport, which are not part of the package, shall not reduce its safety.
- (f) The package shall be capable of withstanding the effects of any acceleration, vibration, or vibration resonance which may arise under conditions likely to be encountered in routine transport without any deterioration in the effectiveness of the closing devices on the various receptacles or in the integrity of the package as a whole. In particular, nuts, bolts, and other securing devices shall be so designed as to prevent them from becoming loose or being released unintentionally, even after repeated use.
- (g) The materials of the packaging and any components or structures shall be physically and chemically compatible with each other and with the radioactive contents. Account shall be taken of their behaviour under irradiation.
- (h) All valves through which the radioactive contents could otherwise escape shall be protected against unauthorised operation.
- (i) For radioactive material having other dangerous properties the package design shall take into account those properties.

### Type A or Type B Packages

Type A or Type B packages must be packaged and labelled in accordance with the Transport Code of Practice.

Type A packages must not have an activity greater than A1 (for special form material, e.g. a capsule) or A2 (for other forms – e.g. liquids and gases) of the radioactive material (see Table 2 in [Appendix 22.1](#)).

If a package has an activity greater than A1 or A2, (Table 2) it must be packaged as a Type B package.

### Placards

At least three placards must be displayed on the vehicle while transporting the material (see Figure 22.1 in [Appendix 22.1](#)).

## Category Labels

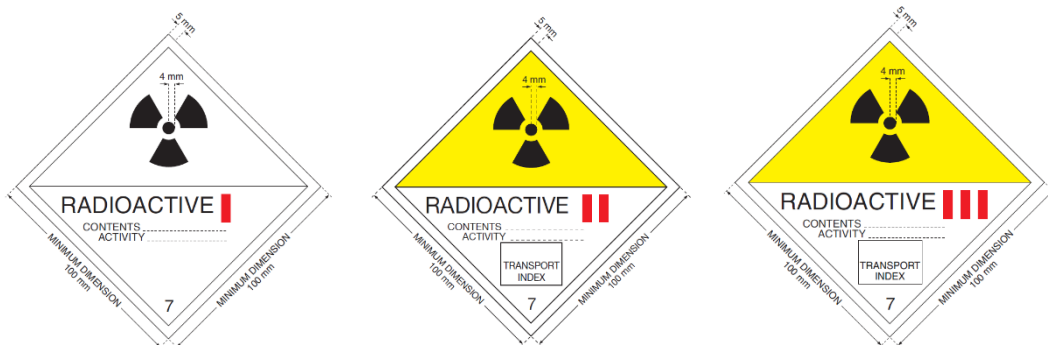
Type A packages have category labels attached to two opposite sides. The label to be used depends on the radiation dose rate at the surface and the transport index. The transport index is the maximum radiation dose rate at any point 1 metre from the surface of the package in  $\mu\text{Sv/h}$ , divided by 10 and then rounded up to one decimal place.

Transport Index	Maximum Radiation Level Category at any Point on External Surface	Category
0 <sup>a</sup>	Not more than 5 $\mu\text{Sv/h}$	I-WHITE
More than 0 but not more than 1	More than 5 $\mu\text{Sv/h}$ but not more than 500 $\mu\text{Sv/h}$	II-YELLOW
More than 1 but not more than 10	More than 500 $\mu\text{Sv/h}$ but not more than 2000 $\mu\text{Sv/h}$	III-YELLOW

<sup>a</sup> If the measured transport index is not greater than 0.05, the value quoted may be zero.

**Note:** Both the transport index and the surface radiation level conditions are taken into account in determining the appropriate category. Where the transport index satisfies the condition for one category but the surface radiation level satisfies the condition for a different category, the package will be assigned to the higher category.

The category labels will need to indicate the radionuclide, its activity in becquerels and, for category II and III, the transport index. The category signs appear as follows:



## Notes for Carriers

### Checklist for Carriers

A checklist such as the following must be completed by carriers before material is accepted for transport. Tick off each item as checked.

WAYBILL OR CONSIGNMENT NOTE		YES	NO
1.	Consignor's name and address present;		
2.	Consignee's name and address present;		
3.	Note number of package(s) present;	Number =	
4.	Confirm whether consignment note states for instance "Dangerous Goods - Radioactive Substances," see attached documents (Dangerous Goods Declaration Form).		
PLACARDS		YES	NO
	At least three placards must be available according to Figure 22.1 in Appendix 22.1		

EMERGENCY ROAD HAZARD SIGNS		YES	NO
	At least three Emergency Road Hazard Signs must be available in the vehicle.		
PACKAGES		YES	NO
1.	Correct number of packages are present;		
2.	Contents are packaged properly;		
3.	Packages are correct size and weight;		
4.	Packages are in good condition and seals are intact;		
5.	Check that labels agree with Consignor's Certificate (Dangerous Goods Declaration Form);		
6.	Check that information on transport index, radioactive substances, and activity given on the package label agree with the Consignor's Certificate (Dangerous goods Declaration Form);		
7.	A package containing liquid should have a "THIS SIDE UP" label if appropriate; and		
8.	The class of the package(s) is marked (e.g. TYPE A, or B) as appropriate.		

DOCUMENTATION		YES	NO
Documentation and other requirements for the transport of radioactive substances by road are contained in the <i>Code of Practice for the Safe Transport of Radioactive Material</i> .			
The consignor must have all the following documents completed prior to commencement of the transport of the radioactive material.			
1.	Movement order or an equivalent document such as waybill, consignment note, or equivalent.		
2.	Consignor's Certificate (Dangerous Goods Declaration Form): <b>NOTE:</b> A minimum of two copies is required. One is for the carrier and one, within a stout envelope, is to be firmly fixed to the outside of the package for inspection in transit. Where more than one carrier is involved, it may be necessary for each carrier to receive a copy of the Consignor's Certificate.		
3.	Package certification as required.		
4.	Special Form Certificate, if applicable, for sealed sources.		
5.	Competent Authority approval as required.		
6.	Information for carriers – a document which provides: (i) any supplementary operational requirements for loading, transport, storage (away from persons, dangerous goods, livestock and films and for safe dissipation of heat), unloading and handling, or a statement that no supplementary operational requirements are necessary; and (ii) emergency arrangements specific to the package.		

## Loading Procedures

- (a) Ensure that details of consignment are entered on the carrier's consignment note or waybill. The consignment note should state that "Dangerous Goods - Radioactive Substances, see attached documents (Dangerous Goods Declaration Form)" are being carried.

- (b) Use a vehicle that will allow several metres or more distance between the driver (and assistant(s)) and the packages; the greater the distance the better.
- (c) The package must be secured on the vehicle. Small, light packages should be stored in a basket while larger, heavy packages should be properly blocked and braced.
- (d) Restrictions on the loading of radioactive substances must be observed in regard to segregation from personnel, photographic film, livestock, and any dangerous goods that need to be segregated.
- (e) The sum of the transport indices of packages loaded on the vehicle and into freight containers should not exceed 50, unless the material is Low Specific Activity (LSA) or unless other exclusive use conditions are applicable.
- (f) Road vehicles, carrying packages, overpacks, tanks or freight containers, must display the placard made according to Figure 22.1 in [Appendix 22.1](#) on each of:
  - (i) At least two external lateral walls in the case of rail vehicles; and
  - (ii) The two external lateral walls and the external rear wall in the case of a road vehicle. Any placards, which do not relate to the contents, shall be removed. Placards on vehicles should not be obscured.
- (g) No passengers are permitted to accompany the driver and his assistant(s) where packages other than those classified as "excepted" are carried.
- (h) The vehicle's load should be securely locked or covered during transport.

## APPENDIX 22.1

### ARPANSA RPS2 CODE OF PRACTICE

#### FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIAL, 2008

Packages with activities lower than those given in the "Exempt Activity" column are exempt from regulations. In NSW the "Activity" exempt from regulation is the "Prescribed Activity" listed in brackets in the same column.

#### 1. Regulations applying to "Excepted Packages"

- (a) The radiation level at any point on the external surface of the package shall not exceed **5  $\mu$ Sv/h (0.5 mrem/h)**
- (b) The non-fixed radioactive contamination on any external surface of the package shall not exceed **0.4 Bq/cm<sup>2</sup>**
- (c) For radioactive material of special form (indispersible solid or sealed capsule), other solid forms and liquids the activity must not exceed the limits listed for the radionuclides in TABLE 1 below.
- (d) The package must bear the marking "**RADIOACTIVE**" on an internal surface in such a manner that a warning of the presence of radioactive material is visible on opening the package.
- (e) The documentation shall include the United Nations Number "2910", and for all items the proper shipping name and description, i.e.: shall be included.

#### "RADIOACTIVE MATERIAL, EXCEPTED PACKAGE LIMITED QUANTITY OF MATERIAL"

	Exempt Activity (Prescribed Activity NSW) (MBq)	Solids		Liquids (MBq)		Exempt Activity (Prescribed Activity NSW) (MBq)	Solids		Liquids (MBq)
		Special Form (MBq)	Other Form (MBq)				Special Form (MBq)	Other Form (MBq)	
Americium-241	0.01 (0.04)	10000	1	0.1	Iron-59	1 (4)	900	900	90
Bromine-82	1 (4)	400	400	40	Molybdenum-99	1 (4)	1000	600	60
Caesium-137	0.01 (0.4)	2000	600	60	Phosphorus-32	0.1 (4)	500	500	50
Carbon-14	10 (4)	40000	3000	300	Phosphorus-33	100 (0.4)	40000	1000	100
Chromium-51	10 (4)	30000	30000	3000	Radium-226	0.01 (0.04)	200	3	0.3
Cobalt-57	1 (4)	10000	10000	1000	Samarium-153	1 (4)	9000	600	60
Cobalt-60	0.1 (0.4)	400	400	40	Selenium-75	1 (4)	3000	3000	300
Fluorine-18	1 (4)	1000	600	60	Sodium-22	1 (0.4)	500	500	50
Gadolinium-153	10 (4)	10000	9000	900	Sodium-24	0.1 (4)	200	200	20
Gallium-67	1 (4)	7000	3000	300	Strontium-89	1 (0.4)	600	600	60
Gallium-68	0.1 (4)	500	500	50	Strontium-90	0.01 (0.4)	300	300	30
Germanium-68	0.1 (0.4)	500	500	50	Sulphur-35	100 (4)	40000	3000	300
Indium-111	1 (4)	3000	3000	300	Technetium-99m	10 (40)	10000	4000	400
Iodine-123	10 (4)	6000	3000	300	Thallium-201	1 (4)	10000	4000	400
Iodine-125	1 (0.4)	20000	3000	300	Tritium (H-3)	1000 (40)	40000	40000	4000
Iodine-131	1 (0.4)	3000	700	70	Xenon-133	0.01 (40)	20000	10000	1000
Iron-55	1 (4)	40000	40000	4000	Yttrium-90	0.1 (4)	300	300	30

For radionuclides not listed above, contact the Radiation Safety Committee.

Excepted packages may contain any quantity of natural uranium, depleted uranium or natural thorium, provided that the outer surface of the uranium or thorium is enclosed in an inactive sheath made of metal or some other substantial material.

### Regulations Applying to Type A Packages

For radioactive material of special form (indispersible solid or sealed capsule) and all other forms the activity must not exceed the limits listed for the radionuclides in TABLE 2 below:



**TABLE 2**
**ACTIVITY LIMITS OF SELECTED RADIOISOTOPES FOR TYPE A PACKAGES**

	Special form A <sub>1</sub> (GBq)	Other form A <sub>2</sub> (GBq)		Special Form A <sub>1</sub> (GBq)	Other Form A <sub>2</sub> (GBq)
Americium-241	10000	1	Molybdenum-99	1000	600
Bromine-82	400	400	Phosphorus-32	500	500
Caesium-137	500	500	Phosphorus-33	40000	1000
Carbon-14	40000	3000	Samarium-153	9000	600
Chromium-51	30000	30000	Selenium-75	3000	3000
Cobalt-57	10000	10000	Sodium-22	500	500
Fluorine-18	1000	600	Sodium-24	200	200
Gadolinium-153	10000	9000	Strontium-89	600	600
Gallium-67	7000	3000	Strontium-90	300	300
Gallium-68	500	500	Sulphur-35	40000	3000
Germanium-68	500	500	Technetium-99m	10000	4000
Indium-111	3000	3000	Thallium-201	10000	4000
Iodine-123	6000	3000	Tritium (H-3)	40000	40000
Iodine-125	20000	3000	Xenon-133	20000	10000
Iodine-131	3000	700	Yttrium-90	300	300

For radionuclides not listed above contact the Radiation Safety Committee.

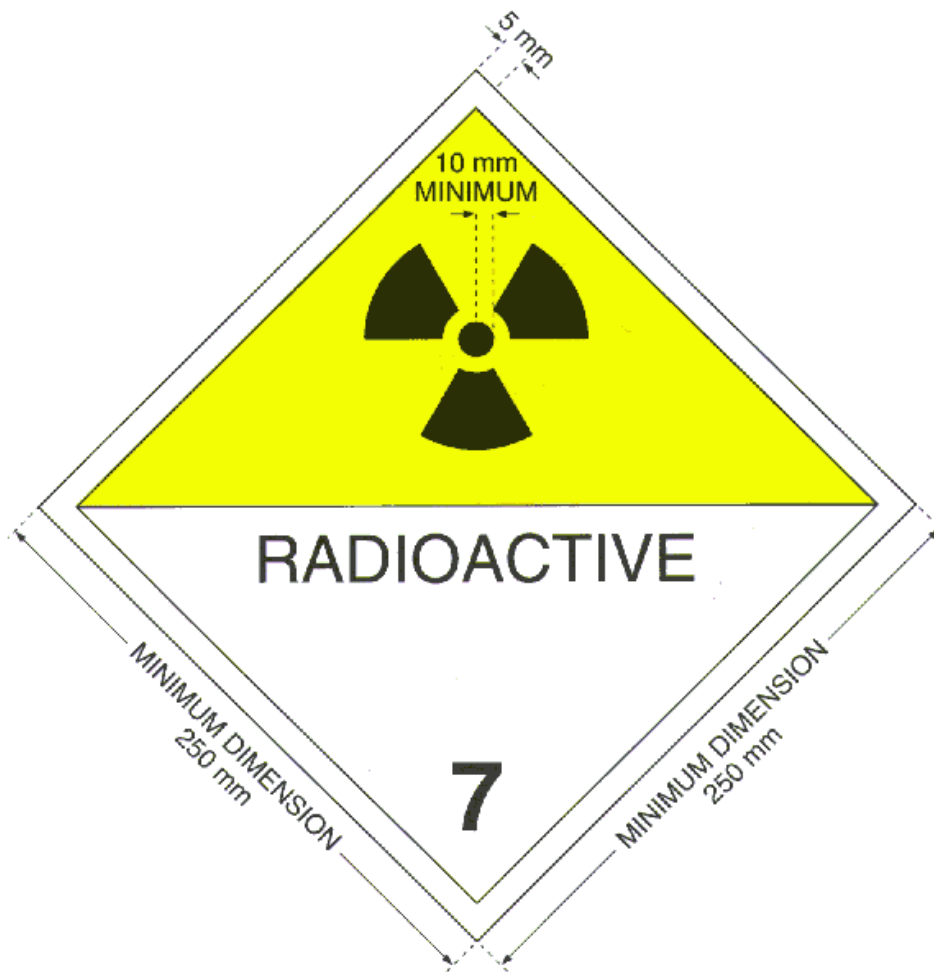
### Placards

Road vehicles, carrying packages, overpacks, tanks, or freight containers, must display the placard made according to Figure 22.1 below, on each of the two external lateral walls and the external rear wall in the case of a road vehicle.

Any placards, which do not relate to the contents, shall be removed. Placards on vehicles should not be obscured.

### FIGURE 22.1

The number “7” shall not be less than 25 mm high. The background colour of the upper half of the placard shall be yellow and of the lower half white, the colour of the trefoil and the printing shall be black. The use of the word “RADIOACTIVE” in the bottom half is optional to allow the alternative use of this placard to display the appropriate United Nations number for the consignment.



## APPENDIX 22.2

**NSW H.U.R.S.O.G.  
RADIOACTIVE MATERIAL TRANSPORT KIT AND  
EMERGENCY PROCEDURES GUIDE**

To be read and carried by all transporters of radioactive materials  
*(To be kept in the document holder in the driver's door  
or a conspicuous place in the driver's compartment)*

Transport of radioactive materials by public transport, taxis, or motorcycles is NOT PERMITTED

**Carry packages securely:**

- in boot of car, or
- away from driver in vans and station wagons, and
- segregated from non-compatible dangerous goods

Do not leave packages unsecured at ANY time.

*For general radiation advice contact:*

Radiation Control Section  
Environment Protection Authority  
Department of Environment and Conservation  
Telephone: 02 9995 5959 (business hours).

In an Emergency, contact:

HAZMAT Team  
Telephone: 000 (All hours)

### INSTRUCTIONS

The following instructions must be followed by all transporters carrying labelled packages of radioactive materials:		YES	NO
1.	Check that a Radioactive Goods (consignment) form is attached to each package and that it has been completed with details of each radioactive material being delivered, destination and name of the addressee.		
2.	Check that a "Shipping Document" for each package is issued to the driver/transporter.		
3.	There are three placard signs in this kit. Put one placard on each side of the vehicle and one on the rear of the vehicle.		
4.	Transport the three Emergency Road Hazard Signs that are in this kit for use in an emergency.		
5.	Transport packages securely either: <ul style="list-style-type: none"> <li>• in the boot of a car; or</li> <li>• away from the driver of a van or station wagon, and</li> <li>• segregated as per ADG code from other incompatible Dangerous Goods.</li> </ul>		
6.	Carry these instructions with you in the vehicle in the document holder.		
7.	Carry the appropriate safety equipment (personal protective, spill, etc) that the estimated risk of the consignment, and any other relevant requirements, deem necessary (for example, a Type A package would have negligible risk and as such no equipment is required).		
8.	Carry a mobile phone to be used in the event of an accident.		
9.	At each destination, deliver the appropriate package together with its consignment form, to the addressee or their agent who should be a licensee. Adjust any "shipping documents" accordingly.		
10.	At your last destination, remove the three yellow transport placards from the outside of the vehicle and replace them in this kit. It is illegal to display Dangerous Goods signs if Dangerous Goods are not in or on the vehicle.		
11.	Passengers are not to be carried at the same time as packages containing radioactive material. However, a licensee responsible for the radioactive material being carried may travel in the vehicle, or if two or more people are required for radionuclide procedures off site, they may all travel in the same vehicle.		
12.	The vehicle must not be left unattended when carrying packages containing radioactive substances, except when delivering a package to its consignee.		

## Accident Action

In the event of an accident, **DON'T PANIC**. The packaging complies with international standard requirements and is designed to withstand accidents. If the package is not severely damaged, the radioactive material is most unlikely to be damaged, and its container is unlikely to leak. **So attend first to the needs of any injured persons.**

If a road vehicle transporting radioactive materials is involved in an accident that results in a dangerous situation (injury, road hazard, escape/leakage of materials, fire, vehicle immobilised, etc), the driver of the vehicle must:

- notify Emergency Services “000” (Police, Fire Brigade, Hazmat, Ambulance);
- notify the Institute’s R.S.O. and/or the responsible head of department;
- provide reasonable assistance to Emergency Services, or the responsible authority officer in charge.

In addition to the above, the routine in the event of such an accident is:

1. leave vehicle (if possible) and assess the injury status of others involved in the accident;
2. at all times, act in a safe manner. If in doubt, leave it to emergency services;
3. assess the integrity of the radioactive packages, with minimal contact (or exposure);
4. with the results of the assessment in mind it may be necessary to complete the above actions of notification – i.e. notify Emergency Services, Institute’s RSO, etc.;
5. if possible, gain the assistance of passers-by to keep onlookers and other traffic at a safe, reasonable distance;
6. use the Emergency Road Hazard signs (three of these are to be carried in the vehicle at all times that radioactive materials are being transported – see Appendix 22.3 attachment for representation of sign);
7. inform Emergency Services of any Environmental or Human hazards (fire, spill, etc.); and
8. wait for and assist emergency services.

Alternatively, if:

- there is no risk from the radioactive materials leaking
- the packages are undamaged
- the damage sustained by the vehicle does not have to be reported to the police and the vehicle can still be driven:
  - i. deliver the parcel to the addressee
  - ii. advise them that the vehicle was involved in a minor accident in transit
  - iii. provide a detailed report to the RSC.

## APPENDIX 22.3

### The Road Hazard Sign

These are to be carried in the vehicle and used any time the vehicle is involved in an accident or becomes immobilised (breakdown, etc.). These signs are to comply with Australian Standard AS3790.

