

**Association of University Radiation Protection
Officers**

**TRANSPORT OF
RADIOACTIVE MATERIALS
BY ROAD**

AURPO Guidance Note No. 6

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1. INTRODUCTION

These guidance notes are an interpretation of the requirements of the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations SI 2009 No.1348 (CDG2009) as they affect the transport of radioactive materials by road. CDG2009 came into force on the 1st July 2009 and replaced CDG2007 and the previously separate Radioactive Material (Road Transport) (Great Britain) Regulations SI 2002 No.1093.

CDG2009 Regulations are based primarily on the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR2009) which in turn are based upon the International Atomic Energy Agency's (IAEA) Regulations for the Safe Transport of Radioactive Materials (Safety Series No.TS-R-1).

It should be noted that CDG2009 is not a 'stand alone' document but has to be used in conjunction with ADR2009. However, gone are the host of cross-references that was CDG2007, now CDG2009 just asks us to transport dangerous goods in accordance with ADR. From our viewpoint, the basic philosophies behind the Regulations have not changed and these are that: -

- a) package design should be such that the risk of any radioactive contamination or external radiation hazard should be kept to a minimum
- b) that all shipments should be traceable back to the sender
- c) that good quality assurance should produce public reassurance.

These guidance notes are intended for the university/hospital/research sector and do not cover the transport of fissile materials or nuclear industry waste.

1.1. *Main Implications of the Regulations /ADR*

1. The category of exempt radioactive material that defines what is significant radioactive material under the regulations remains the same.
2. The requirement for consignment notes in relation to the transport of excepted packages, is restricted to the inclusion of the appropriate UN number and consignor and consignee details in the accompanying transport documents.
3. There is no professional user exemption and all persons must therefore conform fully with all the requirements of the regulations, but, display of smaller placards is allowed for cars carrying labelled packages (and other small vehicles up to 3500kg).
4. Full consignment notes are required for all categories of radioactive package above excepted package.
5. The UN numbers and descriptors are as in the last revision.
6. There is a requirement for carrying fire extinguishers when carrying labelled (Type A) packages. DfT Authorisation 216 removes the need for fire extinguishers when transporting any number of excepted packages.
7. The DfT are the enforcing authority for these Health and Safety Regulations.
8. Contamination limits remain the same for all types of package.
9. More detailed specifications for emergency 'instructions in writing'.

1.2. Definitions

Radioactive substance - what constitutes a radioactive substance under the Transport Regulations is defined in a separate order (SI 2002 No.1092) and is stated as being 0.1kBq/kg (this has not been revoked). However this very low figure is only relevant for any radionuclide not listed in the Regulations. Of more importance is what is defined as being radiologically significant and this is implied by the description of what constitutes exempt material. This varies with the radiotoxicity of the nuclide with some alpha emitters it is only 0.1Bq/g (hence the definition above of what is radioactive) but for tritium it is 1 MBq/g. (see Table 1 in Section 2.2)

Road means any highway to which the public has unrestricted access. Therefore in a campus university if there are barriers to get passed before gaining access to the site, transport on the internal roads are not covered by the Regulations.

Transport of packages in these regulations covers much more than the transportation procedure and also includes the design, fabrication and maintenance of packaging, and the preparation, consigning, handling, carriage, storage in transit and receipt at the final destination of packages.

Transport Index (TI) is an indication of the external hazard that a package presents. It represents the maximum dose rate at 1 metre from a package measured in mSv/h and multiplied by 100. (i.e. it is the dose rate at 1 metre in the old mrem/h units)

Consignor is the person sending the goods.

Consignee is the recipient of the goods.

LSA is low specific activity material including waste.

SCO relates to surface contaminated objects.

A full and extensive description of all terms used in the regulations can be found for Class 7 Radioactive Material in section 2.2.7 of the ADR.

2. SCOPE OF THE REGULATIONS

The regulations cover the transport by road of all non-exempt radioactive material in the form of sources or waste conveyed in a vehicle both within the UK and for journeys in other European countries covered by the ADR (an ADR journey). Exempt radioactive materials are detailed in 2.2 below. Other exceptions to the regulations are as described in section 1.7.1.4 of the ADR and are summarised as follows: -

- transport on private roads
- transport of radioactive material contained in the body of a person (alive!) or a live animal undergoing medical treatment
- transport of radioactive material that is an integral part of the means of transport
- transport of approved consumer products by a consumer
- transport of natural material and ores not destined for processing that are less than 10 times the values specified for exempt materials in Table 1 below
- transport in relation to instruments of war by approved armed forces, Government Departments or their contractors
- transport by emergency services or others in an emergency intended to save human lives
- transport in accordance with an approved derogation
- transport of radioactive contaminated objects where contamination is less than prescribed levels.

2.1. Derogations

There are a number of derogations, applicable to transport within the UK only, that impact on the transport of radioactive materials. These are now published by DfT in a document of ‘Approved derogations and transitional provisions’ relevant ones are detailed below: -

- Road Derogation 1 permits up to 500 domestic smoke detectors with an individual activity not exceeding 40kBq, or 5 GTLDs with an individual activity not exceeding 10 GBq, to be transported without reference to the main body of the regulations.
- Road Derogation 3 provides exemption from the requirements relating to the carriage of fire extinguishers when only carrying excepted packages and a limited number of packages (10). (*This has now been supplemented by Authorisation 216 see p12 below*)
- Road Derogation 9 provides details of the alternative to ‘orange plates’ i.e. the display of the fireproof cab notice when transporting up to 10 packages with a combined TI not exceeding 3. This derogation can be used when transporting fissile excepted or non-fissile radioactive materials in a small vehicle (not exceeding 3.5 tonnes). (Full details of the specification of the cab notice are given in the derogation.)
- Road Derogation 11 permits transport of dangerous goods between private premises (owned by the same establishment) separated by a public road with partial exemption from the requirements of the Regulations. This should assist some institutions that do not have a closed campus but have buildings in close proximity. Regulations exempted are: those covering the need to appoint a DGSA; placarding labelling and documentation; and the driver’s responsibility for emergency action. In addition the general training requirements of Chapter 8.2 do not apply but any specialist training including VTC certification still applies.

Full details of all UK derogations can be found at –
www.dft.gov.uk/426155/approvedderogations.pdf

2.2. Exempt Radioactive Material

TABLE 1 - Activity Limits For Exempt Radioactive Materials

Nuclide	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
H-3	1×10^6	1 GBq
C-11	1×10^1	1 MBq
C-14	1×10^4	10 MBq
F-18	1×10^1	1 MBq
Na-22	1×10^1	1 MBq
Na-24	1×10^1	100 kBq
P-32	1×10^3	100 kBq
P-33	1×10^5	100 MBq
S-35	1×10^5	100 MBq
Cl-36	1×10^4	1 MBq
K-42	1×10^2	1 MBq
Ca-45	1×10^4	10 MBq
Cr-51	1×10^3	10 MBq
Fe-55	1×10^4	1 MBq
Fe-59	1×10^1	1 MBq
Co-57	1×10^2	1 MBq
Co-60	1×10^1	100 kBq
Ni-63	1×10^5	100 MBq
Ga-67	1×10^2	1 MBq
Se-75	1×10^2	1 MBq
Rb-86	1×10^2	100 kBq
Tc-99m	1×10^2	10 MBq
In-111	1×10^2	1 MBq
I-123	1×10^2	10 MBq
I-125	1×10^3	1 MBq
I-131	1×10^2	1 MBq
Xe-133	1×10^3	10 kBq
Cs-137	1×10^1	10 kBq
Tl-201	1×10^2	1 MBq

A consignment will be exempt from ADR unless both the values specified in col 2 and 3 of Table 1 above are exceeded.

NB the limits apply to a consignment and are not package limits or vehicle limits. The limits are therefore the responsibility of the consignor to ensure that for any one consignment they are not exceeded. A carrier could transport a load that comprised of a number of exempt consignments from different consignors where the total activity could exceed the exempt limits but the carrier would not be in breach of the regulations.

3. RESPONSIBILITIES

The employer is responsible for implementation of these regulations and in a university or research centre this responsibility will often be delegated to the Radiation Protection Officer for all matters pertaining to work with radioactive materials. There are certain particular responsibilities that will need to be addressed. Firstly there is the provision of a radiation protection program (ADR 1.7.2). This will largely be covered by what is already in place for IRR99 but other things that need to be covered are special provisions relating to radiological emergencies and reporting of incidents (Reg 24 and Schedule 2) and requirements under CV33 of ADR 7.5.11.

Arrangements for dealing with radiological emergencies should only apply to relatively few as these essentially come from the Radiation (Emergency Preparedness and Public Information) Regulations 2001 (REPPPIR) and should only be applied to relatively large quantities of material. However reference to significant quantities in the definition of what constitutes a radiological emergency is lacking and there is no reference to Schedule 2 of REPPPIR in Schedule 2 of the Regulations.

CV33 of ADR 7.5.11 details special procedures required to ensure: the safety of goods in transit; the safety of transport workers; and the safety of the public from transport operations. It therefore details segregation distances between: yellow labelled packages and workers; members of the public; and mail bags/ photographic film. Activity limits for certain categories of waste are specified and conditions for stowage of radioactive material during carriage and storage in transit are specified. Procedures for dealing with damaged or leaking packages, contaminated packaging and undeliverable consignments are also detailed.

The second main area of responsibility for the employer relates to staff training. There is a training requirement under ADR 1.3 for all staff involved in the transport of radioactive materials and other dangerous goods. All people involved in the transport process from packers through to delivery drivers and goods receptors are affected by this. Training should be appropriate and proportionate to the risk involved in handling the goods in question. All training should be documented (even when just excepted packages are involved) with details kept by the employer and employee. However, a simple instruction sheet should be sufficient where just excepted packages are involved. Further details on training are given in section 9.

The third main area of responsibility for employers is in drawing up a quality assurance programme (see Section 11 of this guidance). One important aspect of this will be to ensure that all the duties described in the regulations for consignors, carriers and the driver are adequately covered. Where it is the institution/ member of staff transporting radioactive materials from one part of the institution to another, or to another institution, they will be acting as consignor/ consignee and possibly driver as well. Procedures will need to be in place to ensure that the requirements for different transport operations detailed in Sections 4-7 below are followed.

The only responsibilities now falling on the driver relate to actions to be undertaken in the event of an accident or emergency and are detailed below in the section on driver training (Section 9.2).

4. TRANSPORT OF EXCEPTED PACKAGES

It should be noted that the Regulations do not differentiate between radioactive sources and radioactive waste when it comes to excepted package quantities. As long as the waste fulfils the requirements for excepted packages it can be transported as such.

The bulk of university transport requirements will be covered by excepted packages.

4.1. Activity Limits for Excepted Packages

As long as the packaging and documentation requirements are met in full, radioactive material in liquid or solid form with an activity not exceeding that given in Table 2 and a surface dose rate not exceeding 5 μ Sv/h, may be transported in an excepted package. When either of these criteria is exceeded then the material must be transported in a Type A package or an industrial package as appropriate.

TABLE 2 Activity Limits For Excepted Packages

Nuclide	Ordinary Solid Form	Liquid Form
H-3	40 GBq	4 GBq
C-11	0.6 GBq	60 MBq
C-14	3 GBq	300 MBq
F-18	0.6 GBq	60 MBq
Na-22	0.5 GBq	50 MBq
Na-24	0.2 GBq	20 MBq
P-32	0.5 GBq	50 MBq
P-33	1 GBq	100 MBq
S-35	3 GBq	300 MBq
Cl-36	0.6 GBq	60 MBq
K-42	0.2 GBq	20 MBq
Ca-45	1 GBq	100 MBq
Cr-51	30 GBq	3 GBq
Fe-55	40 GBq	4 GBq
Fe-59	900 MBq	90 MBq
Co-57	10 GBq	1 GBq
Co-60	400 MBq	40 MBq
Ni-63	30 GBq	3 GBq
Ga-67	3 GBq	300 MBq
Se-75	3 GBq	300 MBq
Rb-86	500 MBq	50 MBq
Tc-99m	4 GBq	400 MBq
In-111	3 GBq	300 MBq
I-123	3 GBq	300 MBq
I-125	3 GBq	300 MBq
I-131	700 MBq	70 MBq
Xe-133	10 GBq (gas)	n/a
Cs-137	600 MBq	60 MBq
Tl-201	4 GBq	400 MBq

NB For special form solid radioactive materials there are higher limits- see Table 2.2.7.2.4.1.2 in the ADR for further details. For instruments containing radioactive materials the individual item limits are ten times the above limits. For gases the limits are the same as for solids, with

the exception of tritium where there is a higher limit. A full list of limits for all radionuclides can be extrapolated from Table 2.2.7.2.2.1 of the ADR by using the factors given in Table 2.2.7.2.4.1.2.

4.2. General Packaging Requirements

a) When necessary, shielding should be provided to ensure that the dose rate at the surface of the excepted package does not exceed 5 μ Sv/h.

For instruments or manufactured articles containing an excepted quantity of radioactive material the above dose rate limit does not apply, but the dose rate 10cm from any external point of any unpackaged instrument or article should not exceed 0.1mSv/h

b) Non-fixed contamination of the external surface of the excepted package shall not exceed:-

i. 4 Bq/cm² for beta, gamma and low toxicity alpha emitters, e.g. natural uranium and thorium;

ii. 0.4Bq/cm² for all other alpha emitters.

c) The package shall 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.

d) The package shall be so designed in relation to its mass, volume and shape that it can be easily and safely handled and retain its contents under conditions likely to be encountered in routine transport, e.g. taking into account acceleration, vibration and braking. The volume of absorbent material should be always at least twice that of a liquid sample. (*Absorbent material requirement - good practice, only an ADR requirement for Type A and above.*)¹

e) 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.

f) As far as practicable, the outer layer of the package shall be so designed as to prevent the collection and retention of water.

g) Any features added to the package at the time of transport, which are not part of the package, shall not reduce its safety.

h) The materials of the packaging and any components or structures shall be physically and chemically compatible with each other and with the radioactive contents. If applicable account shall be taken of their behaviour under irradiation.

i) In addition to the radioactive properties, any other dangerous properties of the contents of the package, such as explosive nature, flammability, pyrophoricity, chemical toxicity and corrosiveness, shall be taken into account in the packing.

j) If the gross weight of the package exceeds 50kg then the maximum weight shall be clearly marked on the package.

NB Additional labelling requirements might be required by other regulations relevant to Dangerous Goods shipments, i.e. The Chemicals (Hazard Information and Packaging for Supply) Regulations 2002 (CHIP 3).

¹ NB when shipping liquid wastes in excepted packages the use of large volumes of absorbent material may not be practicable. It is also recognised that the provision in 4.2c above (internal radioactive marking) is not practical in these circumstances and this is being reviewed.

4.3. Meeting the Packaging Requirements

The screw top cans once used by GE Healthcare (Amersham) are ideal for re-use, as are some of the moulded polystyrene blocks used by other manufacturers. NB if they are being sent to another establishment, then the original suppliers name should be obliterated. As an alternative, polythene/polypropylene bottles or jars with screw fittings or other tight-fitting lids might prove useful. Examples of suitable excepted package designs are given in Figs 1 & 2 below.

FIG 1 Example of Excepted Package - samples

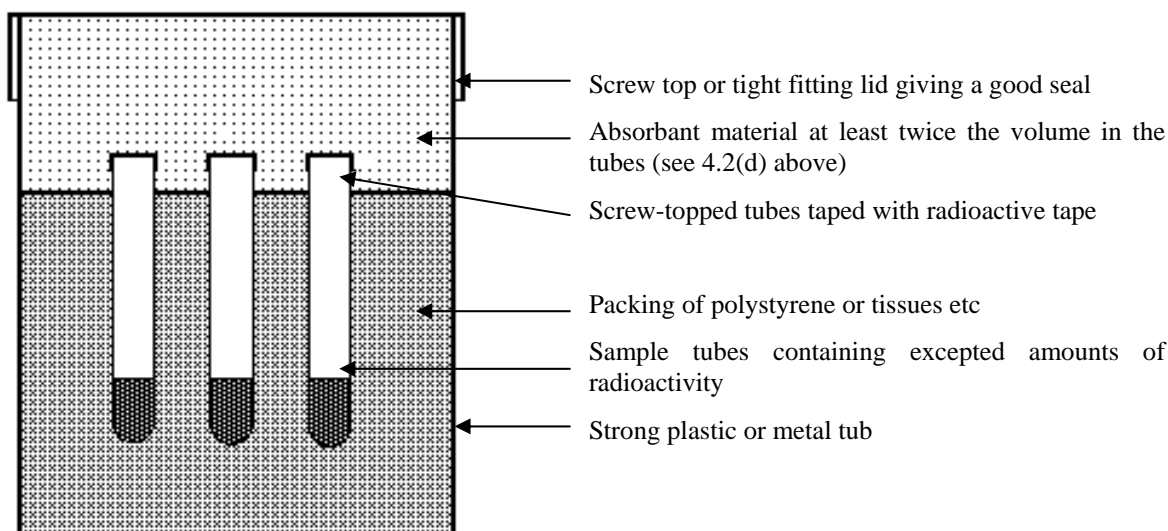
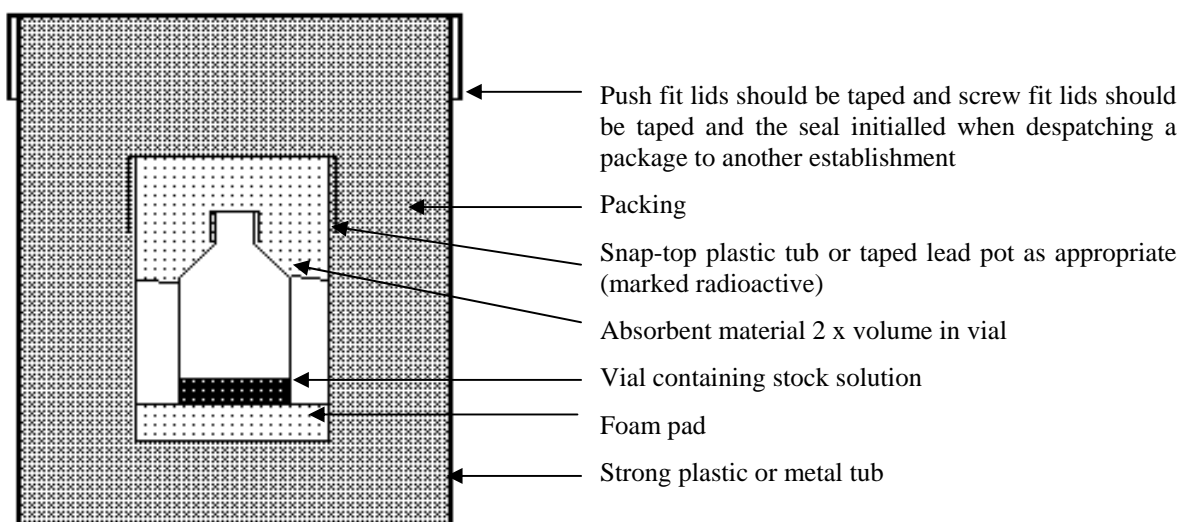


FIG 2 Example of Excepted Package – stock material



Recommended minimum dimension of outer packaging is 10cms.

NB The packaging shown in Fig2 should meet the requirements for a Type A package provided it is robust enough to withstand the appropriate performance tests.

4.4. Transport Documents, Labelling and other requirements

All items and materials transported as excepted packages need only be described in the transport documents by the appropriate UN number (*these correspond to the shipping names given below*)

- UN 2910 *Radioactive Material, Excepted Package - Limited Quantity of Material*
- UN 2908 *Radioactive Material, Excepted Package - Empty Packaging*
- UN 2909 *Radioactive Material, Excepted Package - articles manufactured from natural or depleted uranium or natural thorium*
- UN 2911 *Radioactive Material, Excepted Package - instruments and articles*

There should also be details of the consignor and consignee, the date of shipment and a signed declaration by the consignor (facsimile signature allowed). See example consignment note in Appendix 2. (*NB there is not now a specific legal requirement for this but it may be used as a useful part of a QA program for excepted packages in that it should signify that the basic design requirements have been met.*)

In order to fully comply with the requirements of the transport regulations and the Ionising Radiation Regulations 1999, the following additional information should accompany an excepted package:

- a reference to the applicable transport regulations
- emergency contact details of consignor
- a description of the radioactive substance, e.g. the radionuclide, its activity on a specified date and its chemical and physical form;
- any additional information which would be required to enable the person opening it to do so safely.

The above will more than meet the requirements of the regulations and, as the UN number and either the consignee or consignor details must also be displayed on the outside of the package, it is recommended that a label is made up as in Fig 3 for attachment to the outside of the package.

NB If the transport operation involves air travel the IATA regulations must be observed and these have now introduced their own label for excepted packages see Fig 4. In these circumstances it is advised that just this label should be used. *It should also be noted that to sign off transport documentation that involves IATA requires the person so doing to have been on an IATA approved course.*

Any additional information that may be required can be included in an accompanying letter or technical note that should be found immediately on opening the package.

There is no specific requirement for a record to be kept of shipments of excepted packages but there is of course the requirement under RSA93 to keep records of transfers of radioactive material for 4 years (5 years in Scotland). There is no longer a requirement to keep records relating to measurements of contamination of consignments but again one may want to keep a record for QA purposes. Therefore in order to meet this requirement it may be prudent to continue to keep a log of shipments combined with contamination measurements. All that should be needed is a statement that contamination is less than the permitted level. This will also be satisfactory for a record of other shipments - see example Table 3.

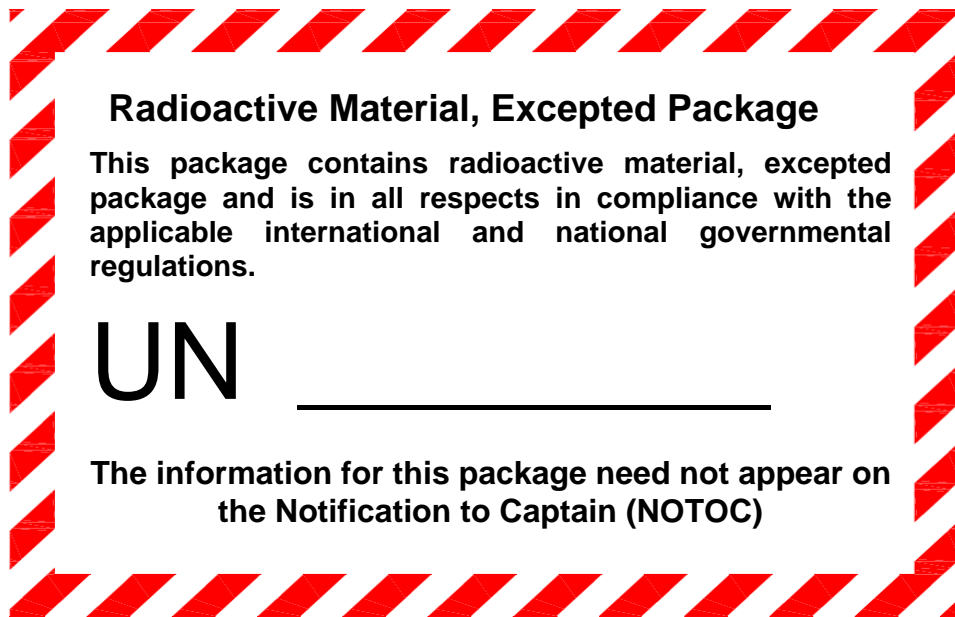
TABLE 3 Log Of Radioactive Material Consignments

Date	Type of shipment	Type of material	No. of packages	TI	Contamination check
19.08.02	Exempt	Beta	4	N/A	<4Bq/cm ²
20.08.02	Type A	Alpha	1	0	<0.4Bq/cm ²
20.08.02	IP-2 (waste)	Beta/gamma	10	0	<4Bq/cm ²

FIG 3 Label/Consignment Note for Excepted Packages

The Carriage of Dangerous Goods etc Regulations 2009 UN 2910	
Date	Physical form.....
Isotope.....	Chemical form.....
Activity.....	
Dispatched by - UNIV of SHEFFIELD, DEPT of Postcode	
Contact Tel	
Deliver to	
I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name, and are classified, packed, marked and labelled, and are in all respects in proper condition for transport by road according to the applicable international and national governmental regulations. For the Consignor	

Fig 4 Transport Label for Excepted Package (IATA)



There are no requirements for the placarding of vehicles either internally or externally when transporting excepted amounts of radioactive material. However, please remember before transporting any radioactive material by car, check your car insurance policy (note there is a distinction between ‘irradiated nuclear fuel’ and other radioactive materials!).

There is no requirement for carrying a fire extinguisher for any number of packages under DfT Authorisation 216 – see - <http://www.dft.gov.uk/pgr/freight/dgt1/rail/exceptions1/auths/>

There are no restrictions regarding: the mixed contents of packages, carrying a mixed load on the vehicle, travel of persons in the vehicle or parking of the vehicle.

4.5. Transport of Empty Packaging as Excepted Packages

The requirements for empty packaging are generally designed for re-usable packages where there may be contamination of some of the internal surfaces or where depleted uranium forms part of the shielding and containment system. The general conditions are that:-

- a) the internal non-fixed contamination does not exceed -
 - 400 Bq/cm² for beta/gamma/low toxicity alpha emitters
 - 40 Bq/cm² for other alpha emitters
- b) the packaging shall be in a well maintained condition and securely closed
- c) any depleted uranium shield should be covered in an inactive sheath
- d) any previous radioactive labels should be obliterated
- e) all the other conditions for the transport of excepted packages should be followed.

4.6 Transport of Excepted Packages in an ‘Overpack’

An individual consignor is permitted to ship a number of excepted packages packed together in an ‘overpack’ for ease of handling and stowage. Each excepted package must conform with the ADR in its own right. The overpack can then be treated as an excepted package for labelling purposes even if the combined activity of the contents exceeds the excepted package limits.

5. TRANSPORT OF TYPE A PACKAGES

5.1. Activity Limits for Type A Packages

TABLE 4 - Activity Limits for Type A Packages

Nuclide	Special Form - A ₁	Other Forms - A ₂
H-3	40 TBq	40 TBq
C-11	1 TBq	0.6 TBq
C-14	40 TBq	3 TBq
F-18	1 TBq	0.6 TBq
Na-22	0.5 TBq	0.5 TBq
Na-24	0.2 TBq	0.2 TBq
P-32	0.5 TBq	0.5 TBq
P-33	40 TBq	1 TBq
S-35	40 TBq	3 TBq
Cl-36	10 TBq	0.6 TBq
K-42	0.2 TBq	0.2 TBq
Ca-45	40 TBq	1 TBq
Cr-51	30 TBq	30 TBq
Fe-55	40 TBq	40 TBq
Fe-59	0.9 TBq	0.9 TBq
Co-57	10 TBq	10 TBq
Co-60	0.4 TBq	0.4 TBq
Ni-63	40 TBq	30 TBq
Ga-67	7 TBq	3 TBq
Rb-86	0.5 TBq	0.5 TBq
Sr-90	0.3 TBq	0.3 TBq
In-111	3 TBq	3 TBq
I-123	6 TBq	3 TBq
I-125	20 TBq	3 TBq
I-131	3 TBq	0.7 TBq
Xe-133	20 TBq	10 TBq
Cs-137	2 TBq	0.6 TBq
Tl-201	10 TBq	4 TBq
Am-241	10 TBq	1 GBq

NB see Table 2.2.7.2.2.1 of the ADR for a full listing

Packages whose activity exceeds the limits for excepted packages (Table 2) or whose surface dose rate exceeds 5 μ Sv/h will have to be transported as Type A packages as long as the activity being carried does not exceed the limits specified in Table 4 above.

5.2. Packaging of Type A Packages

As well as conforming to the general packaging requirements as outlined in the section for excepted packages, Type A packages have to meet the requirements of ADR 6.4.7. Here the full details of the construction, testing and approval requirements for packages are described. Type A packages have to undergo various performance tests to demonstrate an ability to withstand the normal rigours of transport (ADR 6.4.15).

Key items of the design are that there should be a minimum external dimension of 10cm, that the outer packaging should incorporate a seal which will give evidence that the package has not been tampered with and that for packages containing liquids there should be at least twice the volume of absorbent material as of the liquid contents which should be contained within a multiple containment system. The package must withstand temperatures ranging from -40°C to +70°C and a reduction of pressure down to 60 kPa. (Fig 2 design recommended for excepted packages would meet the requirements for Type A provided it could pass the performance tests.)

The design has to be robust enough to ensure that after being subjected to the performance tests it would prevent:

- a) loss or dispersal of the radioactive contents;
- b) no more than a 20% increase in the radiation level at any external surface

The performance tests for Type A packages are given in Section 6.4.15 for solids with special additional requirements for liquids and gases given in Section 6.4.16. The tests are summarised as follows:-

- a) water spray test - simulated exposure to rainfall
- b) free drop test - normally from height of 1.2m for solids and 9m for liquids
- c) stacking test - to simulate storage conditions
- d) penetration test - by a 6kg bar from a height of 1m for solids and 1.7m for liquids.

If you are going to produce your own Type A packages you will need to refer to the ADR for full details. There are companies who type test and supply Type A and Type B packages - see appendix 1 for details. There is also the option of re-using Type A packaging which you may have been sent, but you have to be careful as you are then responsible for declaring it as being in a proper condition for transport. Some companies state that their packaging is for one use only. If you were to re-use it as Type A you would have to satisfy yourself that: it was in an as new condition, that the containment system was complete and in place, and that it was being used to transport the same material for which it was designed. One would also need to obliterate any previous consignors labelling.

NB DfT (Barlow, May 2008) have accepted that reuse of 'single-use' Type A packaging for shipment of excepted quantities is acceptable provided the packaging is still fit for purpose and the consignor has certified that it meets regulatory requirements.

5.3. *Categorisation and Labelling of Type A Packages*

Except for 'exclusive use' shipments the radiation levels for Type A packages shall not exceed:-

- a) 0.1mSv/h at 1m from any external surface; or
- b) 2mSv/h at the surface.

Under 'exclusive use' (i.e. only radioactive items under the control of a single consignor) these limits can be extended up to 10mSv/h at any point on the external surface of a package. For full details and conditions see CV33 (3.5) on page 583 of ADR.

Type A packages are categorised and labelled according to their Transport Index (TI) which represents a measure of the external radiation hazard (see Table 4 below). It is the dose rate at 1 metre in the old mrem/h units. In the new SI units TI is the number of mSv/h multiplied by 100.

TABLE 4 Categories of Type A Package

CATEGORY LABEL	TRANSPORT INDEX	MAXIMUM DOSE RATE on EXTERNAL SURFACE
I - White	0	< 0.005mSv/h
II - Yellow	0 - 1	> 0.005 < 0.5mSv/h
III - Yellow	> 1 < 10	> 0.5 < 2mSv/h*

* Exclusive use Yellow III could have dose rates up to 10mSv/h on external surface.

Therefore it can be seen that there will only be an external hazard with the Yellow label packages and that Yellow III packages can have quite high dose rates and must be handled with care.

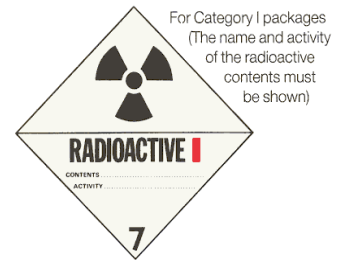
Each Type A package shall be clearly marked 'Type A' and if its weight exceeds 50kg the weight of the package must be clearly stated as well.

The appropriate category labels shall be affixed to two opposite sides of the package with details of the contents, activity and transport index marked on them. Full details of label design are given in Chapter 5.2 of the ADR and examples are displayed opposite.

In addition, details of the consignor and consignee should be clearly indicated and the correct UN number and proper shipping name must be clearly and durably displayed.

It should also be noted that IP2, IP3 and Type A packages should be marked with the international vehicle registration code (VRI Code) which indicates an approved package design suitable for international traffic in accordance with Vienna Convention on Road Traffic (1968).

Hazard labels



5.3.1 UN numbers for Type A packages

Type A package descriptions have been split into fissile and non-fissile and special form and non-special form. The most commonly used ones will therefore be as follows:-

UN 2915	RADIOACTIVE MATERIAL, TYPE A PACKAGE - non-special form, non-fissile
UN 3332	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM - non-fissile

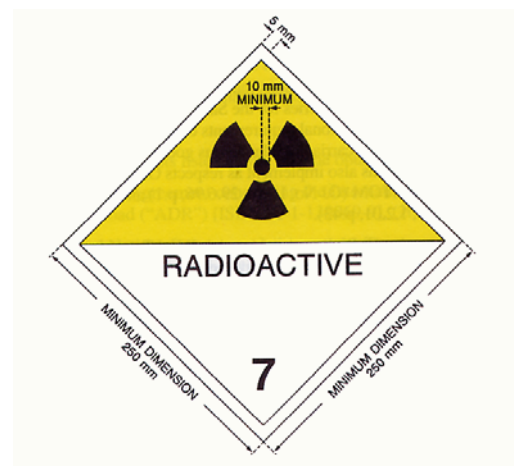
5.4. Transport Documents for Type A packages

The full requirements to be complied with are specified in ADR 5.4. This is generally done by the production of a consignment certificate. Please see appendix 2 for an example. In addition to the consignment certificate there is a requirement to provide the carrier with a statement regarding any special precautions required for the transport of the package together with details of emergency procedures (see 5.6(f) below).

There is a requirement under Regulation 31 (2) to retain details of the transport documents for a period of 3 months after the completion of the journey. This was previously just a duty of the carrier, but responsibility for this is not now clear. It would seem prudent however for all parties carrier/consignor/consignee to keep a copy of the consignment certificates or for consignees/consignors just to keep a log of shipments together with records of monitoring as in Table 3 above and as detailed in section 3.4. There is a QA requirement to demonstrate compliance with the Regulations and retention of these documents will assist with this.

5.5. Placarding of Vehicles

All vehicles transporting any type of labelled radioactive package other than excepted packages must display vehicle placards. There are no professional user exemptions. Three placards (as in 5.3.1.7.2 of the ADR - see opposite) must be displayed, one each side of the vehicle and one at the rear. The standard size of these is 25cm x 25cm. There is however a derogation for vehicles which have insufficient area to display this size of sign (see para 5.3.1.7.4 of the ADR). No definition of this is given but we can take it to mean that if you are using a car for the transport of radioactive materials then you are permitted to use smaller placards - 10cm x 10cm is the minimum size permitted. The best way of placarding the car is then to use signs which will adhere to the inside of the glass windows of the vehicle - you then will not lose signs which could otherwise fall off the outside and you will avoid damaging the bodywork of the car.



In addition to displaying the radiation trefoil placards, there is a requirement to display orange plates (400mm x 300mm or for small vehicles 300mm x 120mm) at the front and rear of the vehicle, or alternatively Road Derogation 9 (see 2.1 above) can be used that permits a fireproof cab notice to be used instead. The cab notice is preferred for cars and it also serves to remind the driver what to do in an accident situation. This can best be made out of stainless steel with the lettering either stamped or embossed on.

5.6. Other Requirements for Type A Packages

- a) Non-fixed contamination of the external surface of Type A packages shall not exceed the general levels specified for excepted packages (see para 3.2).
- b) Dose rates external to the vehicle shall not exceed 2mSv/h at any point and shall not be greater than 0.1mSv/h at 2m from the vehicle.
- c) Travel in the vehicle should generally be restricted to the driver and his assistant(s) in a passenger compartment with the packages in a goods compartment.
- d) The vehicle shall not unnecessarily be left unattended, and if it is, it shall be for as short a period as possible and the stowage compartment must be kept locked.
- e) For vehicles less than 3.5 tonnes 2 x 2kg dry powder fire extinguishers must be carried. For vehicles greater than 3.5 tonnes 1 x 6kg and 1 x 2kg fire extinguishers must be carried.
- f) 'Instructions in Writing' must be provided for the vehicle crew (see ADR 5.4.3) that detail emergency equipment to be carried and actions to be taken in an emergency. It is probably best to combine this requirement with other instructions/reminders for the driver. An example of this is given in Appendix 5. (see also 9.2.1 below)

6. TRANSPORT OF TYPE B PACKAGES

Material whose activity exceeds the limits specified for Type A packages in Table 4 must be transported in Type B packages.

The design of Type B packages requires competent authority approval. Type B packages have to comply with all the general requirements for package design as previously outlined together with specialised requirements as outlined in ADR 6.4.8 and 6.4.9.

They also have to comply with the placarding and labelling requirements as described for Type A packages except that the packages need to be marked 'Type B' together with a unique serial no. and an embossed or stamped radiation trefoil.

All the other requirements outlined for Type A packages also apply.

7. TRANSPORT OF WASTE

Low activity wastes can be transported in excepted packages as long as you can satisfy the excepted package limits (see Table 1). As these are quite generous, the most limiting factor will be the external dose rate limit of 5µSv/h.

It is strongly recommended that you try and keep your waste within these limits as this then avoids the need to label the packages with radiation trefoils and also means that no vehicle placards or cab notice are required. See section 3 for all the details.

If your waste cannot satisfy the excepted package limits then you will need to use the appropriate 'industrial package' and transport the waste as either 'LSA' material (ADR 2.2.7.2.3.1) or 'SCO' material (ADR 2.2.7.2.3.2) or a combination of the two.

Last time this was considered it was thought that the most appropriate category of 'LSA' would be 'LSA-II' as this covers substantial activities of liquids, solids and gases of all radionuclides. However, although LSA-I is essentially for uranium and thorium materials, LSA-I (iv) does cover other radioactive material in which the radioactive material is distributed throughout and the estimated average specific activity does not exceed 30 times the

exempt concentration levels given in Table 1 (above). When extrapolated these limits seem more than adequate for most waste streams from research labs – see Table 5 below.

TABLE 5 – Waste activity limits under LSA I (iv) ADR 2.2.7.2.3.1.2a

Nuclide	Activity in 10kg of waste
H-3	300 GBq
C-14	3 GBq
S-35	30 GBq
P-32	300 MBq
I-125	300 MBq

The most appropriate category of ‘SCO’ is ‘SCO-I’ which relates to relatively low levels of fixed and loose contamination on surfaces of waste items. Most contamination will be relatively fixed and the limit for beta and gamma emitters averaged over 300cm² is 40kBq/cm². (For more details on LSA and SCO see 2.2.7.3 and 2.2.7.5 of the ADR.)

If just transporting LSA-I or SCO-I then you just need to use an IP-1 package which does not require performance testing. If transporting higher categories of waste you will need to use an IP-2 package. An IP-2 package must meet the general requirements for all packages as previously outlined together with the requirements as specified in 6.4.5 of the ADR. A sealed drum that can withstand a small drop test and a stacking test is most commonly used.

Placarding and labelling etc is as required for Type A packages except that in addition on the labels the category of LSA or SCO must be specified as well as the package being marked with the appropriate type approval (TYPE IP-1 or TYPE IP-2), see section 5.2.1.7 of the ADR).

7.1. UN numbers used for waste

- UN 2912 RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I)
- non-fissile
- UN 3321 RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II)
- non-fissile
- UN 3322 RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III)
- non-fissile
- UN 2913 RADIOACTIVE MATERIAL, SURFACE CONTAMINATED
OBJECTS (SCO-I OR SCO-II) - non-fissile

8. REGULAR CONSIGNMENTS

Although not specified in the current regulations, DfT have indicated that the continued use of 'Regular Consignment Certificates' is permitted under the new regulations as consignment notes do not now have to show a date and therefore can be used more than once. Where the same radioactive source is being transported on a regular basis in the same packaging by the same consignor, who is also the carrier, then a 'regular consignment certificate' can be used. There is no need to seek approval from the Dept of Transport for use of these regular consignment certificates. They should be for use in the UK only.

The consignment certificate will include all the details normally required except that consignee details do not need to be specified. The certificate should specify that it is a 'regular consignment certificate' and give an issue date and an expiry date. Such a certificate produced by the consignor should only be valid for up to 3 months. When a 'regular consignment certificate' is being used a log must be kept with it in which details of all destinations and dates of shipment are recorded.

Copies of regular consignment certificates used by the consignor together with the log of journeys must be retained for inspection for a period of 2 years from the date of issue. (*Although not a legal requirement this would again be good QA*).

It is envisaged that these 'regular consignment certificates' will be of most use to people transporting mobile radiography sources or neutron density gauges.

9. TRAINING

9.1 General Training

All persons involved in transport operations concerning dangerous goods shall receive documented training in accordance with Chapter 1.3 of the ADR. The level of training shall be appropriate to the hazards presented by the loads carried and shall normally consist of general awareness training, any specific duties and familiarisation with the appropriate miscellaneous requirements of Chapters 8.3 – 8.5 of the ADR. These deal with the following and are highlighted where they also apply to excepted packages :

- Carriage of passengers – not permitted
- Use of fire-fighting appliances – crew to be trained
- Prohibition on opening of packages (*applies to excepted packages*)
- Portable lighting apparatus not permitted (*applies to excepted packages*)
- Prohibition on smoking (*applies to excepted packages*)
- Running the engine – should normally be shut down during loading and unloading
- Use of parking brake compulsory
- Supervision of vehicles required except when in a secure location (*applies to excepted packages*)

Although not mentioned as a training requirement the ADR requirements relating to 'Miscellaneous equipment and equipment for personal protection' (para 8.1.5), for the

Carriage of Type A packages and above, obviously need to be known by the people concerned. These require vehicles to be fitted with the following equipment:-

- One wheel chock
- Two self standing warning signs (cones, triangles or flashing amber lights – independent of vehicle)
- Eye rinsing liquid
- Other specialist equipment as required (see further details in ADR)

And each member of the crew should be provided with:-

- Hi-vis warning vest or jacket
- Pocket lamp
- Protective gloves and eye protection

Another aspect of training not specifically mentioned but a requirement under 1.10.2 of ADR is in relation to security training when transporting Type A or higher levels of activity. For security purposes each member of vehicle crew shall carry photo ID badge with them and shall receive training in security awareness which also needs to be part of refresher training. Security awareness should consider security risks and risk reduction measures. Anyone carrying 'high consequence dangerous goods' will also require security plans and more specialist security training (see ADR 1.10.3) but these type of loads are outside the scope of these guidance notes.

9.2 Driver Training

The level of training required for drivers should be appropriate to the hazard presented by the load carried. This is covered by ADR 8.2.

- i.** those who will only be involved with the transport of excepted packages - training is covered by the general training requirement specified in 9.1 above.
- ii.** those transporting excepted packages and up to 10 Type A packages at any one time (where the sum of the Transport Indexes is less than 3) - they will require training and must hold a certificate provided by the employer confirming that they have received instruction and training enabling them to -
 - a) understand the hazards presented by the goods they are transporting and the action to be taken in the event of an emergency
 - b) know their duties under Sections 3, 7 and 8 of the Health and Safety at Work etc Act 1974
 - c) know their duties under CDG 2009
- iii.** those transporting higher activities of material - they will be required to attend a course approved by DfT to obtain a vocational training certificate valid for 5 years (*now administered by the Scottish Qualifications Authority*)

It is envisaged that most people transporting radioactive material in a university or hospital context will fall within the first two categories and the level of training will largely be left to the individual institution to decide what is appropriate. Where a porter is just assisting in a particular job and is supervised by an experienced trained worker then brief instruction and a check list of do's and don'ts should be sufficient training.

The Institution of Physics and Engineering in Medicine and Biology have drawn up a 2 hour course which they recommend for hospital drivers. This may also be applicable for other large establishments transporting material which they have dispensed themselves.

An outline syllabus suitable for the training of drivers involved in the transport of radiopharmaceuticals is given in Appendix 3 with details of the actual procedures for the drivers given in Appendix 4 (both courtesy of Medical Physics Dept, Cardiff and Vale UHLB).

For the average university where most packages will be excepted or Type A packages, the driver's job should be very straightforward and the amount they need to know about radiation protection will be limited. Don't forget the packages will have been designed so that even in an accident situation the radiation hazard should be minimal. A short talk together with a list of reminders for the driver should be all that is required (see example in Appendix 5). (In this example the driver is just responsible for completing the transport process started by the manufacturer and all packages will have a consignment certificate with them.)

Drivers should have their reminder sheets with them at all times for reference and in case of emergency.

An annual check on the driver's knowledge of dealing with radioactive shipments should form part of a quality assurance system.

Drivers, carriers and consignors have responsibilities under Regulation 24(2) - action to be taken in the event of an emergency. These responsibilities are detailed in Schedule 2 (5) of the Regulations. Here the driver is expected to follow his 'instructions in writing' and to report accidents and incidents to the police and (where appropriate) the fire brigade and the consignor. In most circumstances he will be following his emergency procedures and reporting to his institution/carrier who will carry the ultimate responsibility for the reporting of accidents/incidents.

Responsibilities of carriers are detailed in CV33 of ADR 7.5.11 and relate to segregation of packages, their correct stowage, and undeliverable consignments. These are all things that the driver will also need to know about however as he acts on behalf of the carrier. However, the legal responsibilities lie with the 'Consignor' and the 'Carrier', which in most small user situations where an employee is used to deliver the goods will be the same person (i.e. the driver's employer).

9.2.1 Instructions in writing

The requirements for 'instructions in writing' for emergency procedures have been expanded in the latest version of the ADR. Where people are involved in the transport of dangerous goods in general rather than just the transport of radioactive materials then the full 4 page model of 'instructions in writing' will be expected by DfT inspectors (see ADR 5.4.3.4). However, if solely concerned with the transport of a few radioactive packages then a condensed version containing all the relevant instructions together with drivers responsibilities (see Appendix 5) should be sufficient to satisfy an inspection.

10. APPOINTMENT OF SAFETY ADVISERS

ADR 1.8.3 requires the appointment of a Dangerous Goods Safety Adviser (DGSA) by an employer whose first or secondary business activity is the transport of dangerous goods or

where an employer undertakes such transport on more than an occasional basis and there is the risk of pollution in an accident.

There is a derogation from the appointment of a DGSA under Road Derogation 11 (see 2.1 above) governing the crossing of public roads. If one is just distributing radioactive materials around campus (where buildings are in close proximity if not on private grounds) then a DGSA should not be required.

What constitutes more than occasional transport is debatable, although anything more than weekly would probably be considered frequent and anything less than monthly infrequent. Remember it is only the transport of Type A packages or above that count as journeys in the above assessment. What is significant in relation to a pollution hazard has previously been defined by DfT (in INDG234) as being greater than the thresholds that require a Vehicle Training Certificate i.e. more than 10 Type A packages or where the TI is greater than 3.

DfT have previously indicated that they would only be looking for a DGSA where significant loads (as defined above) were being transported on a 'regular basis'.

Given this interpretation, it is unlikely that most small users, with the exception of hospital dispensaries, will require a DGSA in relation to radioactive materials transport. They should however ensure that their RPA is conversant with the transport regulations and can adequately advise them on Class 7 ADR issues as well as on IRR99 requirements.

However, another consideration is the frequency of journeys involving other dangerous goods in more than limited quantities. All such journeys together with radioactive material journeys need to be taken into account when considering the overall requirement for a DGSA. Further guidance on the role and requirements for a DGSA can be found in the HSE's guide to CDG (see Ref 8).

11. QUALITY ASSURANCE PROCEDURES

The key requirements of a quality assurance programme are to have all procedures affecting quality fully documented, to make sure that everyone involved in the process is aware of their responsibilities, to have a system of checking to see that procedures are being observed and then applying corrective actions as and when required.

The best guide on 'quality assurance for the safe transport of radioactive materials' (for small scale transport operations) can be found in IAEA Safety Series No.113. It gives excellent summaries of requirements for a range of different scenarios. IAEA have recently upgraded their guidance in this field with IAEA Safety Guide TS-G-1.4 (2008) – 'The Management System for the Safe Transport of Radioactive Material' but this is more appropriate for a 'high-end' user.

The quality assurance process starts with the design of the packaging, its manufacture and performance testing (if necessary).

Those who make their own Type A packaging will need to carry out the appropriate performance tests and have documentary evidence to show that the design has passed the tests. This is an expensive business for one-offs and an alternative is to buy certificated packages from the suppliers listed in appendix 1. Most universities will not be involved in this aspect of transport.

For excepted packaging no performance tests are required and just the general packaging requirements have to be met. If you are involved in supplying radioactive materials to others on a regular basis you will need to have sourced some packaging which will meet the IAEA specifications and any other specifications to make the packaging fit for purpose. These design specifications will then need to be documented in line with European Package Design Specifications (<http://www.dft.gov.uk/adobepdf/165226/460089/radioactivematerial.pdf>)

For one-off excepted package shipments, following the requirements detailed in sections 4.2 and 4.3 above and signing the packaging off as meeting these specifications should be sufficient documentary evidence for the suitability of the packaging.

11.1. *Outline Quality Assurance Program Suitable for a University*

- 1) *General policy statement* - provision of a transport service on behalf of university departments in compliance with the current transport regulations.
- 2) *Nature and Scope of Activities* - what aspects of the transport procedures are involved and the operations involved e.g. waste disposal.
- 3) *Organisational Structure* - who does what and what are their responsibilities.
- 4) *Document Control/Records* - details of the documentation of the QA program and of the documentation of records.
- 5) *Instrument and Test Control* - details of instruments used to measure dose rates and contamination .
- 6) *Procedure Control* - details of procedures for each transport operation. These are likely to cover :-
 - a) waste disposal
 - b) ordering, receipt and delivery of radionuclides
 - c) one-off non-routine shipments
- 7) *Staffing and Training* - details people involved and training given
- 8) *Audits* - an external audit should not be necessary however brief details of an internal auditor should be specified. Annual audit appropriate. NB note non-compliance actions required by Clause 309 of 2009 edition of IAEA TS-R-1.

12. BIBLIOGRAPHY

1. The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (CDG2009) <http://www.opsi.gov.uk/si/si2009/20091348.htm>
2. The Radioactive Material (Road Transport)(Definition of Radioactive Material) Order 2002 SI 2002 No.1092 <http://www.legislation.hmso.gov.uk/si/si2002/20021092.htm>
- 3.The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) 2009. http://www.unece.org/trans/danger/publi/adr/adr_e.html
4. IAEA Safety Standards Series No.TS-R-1 (2009 Edition) - Regulations for the Safe Transport of Radioactive Materials. <http://www-ns.iaea.org/standards/documents/default.asp?sub=200>
5. IAEA Safety Standards Series No. TS-G-1.1 (ST-2) - Advisory material for the IAEA Regulations for the Safe Transport of Radioactive Material. (*see IAEA web address above*)
6. IAEA Safety Series 113 - Quality Assurance for the Safe Transport of Radioactive Material (1994) (*see IAEA website above for latest quality assurance guidance*)
7. BS 5750:part8:1991 - Quality Systems, Part 8. Guide to quality management and quality systems elements for services.
8. ADR and the Carriage Regulations, HSE – <http://www.hse.gov.uk/cdg/manual/adrcarriage.htm>

Acknowledgements

Many thanks to Gordon Middleton and Matthew Talboys of Medical Physics Department, Cardiff and Vale University Local Health Board for producing Appendix 3 - Example Outline Syllabus for Driver Training, and Appendix 4 - Example Procedure for Drivers Transporting Radiopharmaceuticals.

Thanks also to all members who have provided valuable comments (*and corrections!*).

APPENDIX 1

The following list is taken from the IATA website and details companies who manufacture containers for the transport of dangerous goods (search for 'dgre' to find latest list).

Suppliers	Telephone/Fax/email/www	Drums	Boxes	Others
Air Sea Containers Ltd. Birkenhead	0151-645 0636 0151-644 9268 sales@air-sea.co.uk www.air-sea.co.uk	1A1 1A2 1G 1H1 1H2	4D 4DV 4G 4GV 4H 4H2	IP1 IP2 IP3 IP3A IP5 3H1 6HA1 Div. 6.2 (PI 602/650)
CJK Packaging Ltd. High Peak, Derbyshire	01663 750 222 01663 750 33 sales@cjkc.co.uk www.cjkc.co.uk	1A1 1B1 1G 1H1 1H2	4D 4G 4GU 4GV	IP2 3H1
Croft Associates Ltd. Oxfordshire	01865 407 740 01865 407 449 sales@croftltd.com www.croftltd.com			IP1, IP2, IP3 Class 7 Type A TypeB(U)
CurTek UK Ltd. London	020 8568 4445 020 8568 4446 curtec.uk@curtec.com www.curtec.com	1H2	4H2	
DGP (UK) Ltd. Global HQ York	01904 607 390 01904 607 391 uk@dpggroup.com www.dpggroup.com	1H2	4G 4H1 4H2	IP2 IP5 5H4 Div. 6.2 (PI 602/650)
Inmark Europe, Ltd. Long Crendon, Bucks	(0) 845 602 4450 (0) 845 602 4456 sales@inmarkeurope.co.uk www.inmarkeurope.co.uk		4G 4GU	Div. 6.2 (PI 602/650) 11G
Laminar Medica Ltd. Tring, Hertfordshire	01442 828 664 01442 827 056 enquiries@laminarmedica.co.uk www.laminarmedica.co.uk		4G 4H2	Div 6.2 (PI 602/650)
Mega-Pak Limited Slough, Berkshire	01753 218600 01753 534600 sales@mega-pak.com www.mega-pak.com	1A1 1A2 1H1 1H2	4D 4DV 4G 4GV	3H1 Div. 6.2 (PI 602/650)
Nefab (UK) Packaging Ltd. Milton Keynes MKA 1LL	(0) 247 671 7811 (0) 247 671 7811 info@nefab.sco.uk www.nefab.co.uk		4D 4DV 4G	

APPENDIX 3 –Example Outline Syllabus for Driver Training

A. Introduction

1. General understanding of the driver's duty to transport dangerous goods safely through knowledge, skill and careful driving.
2. Understanding the existence and requirements of relevant national and international regulations and agreements applicable to the transport of radioactive materials as they relate to the duty of the driver.

B. Nature of Goods

1. Understand the nature and use of radioactive materials.

C. Hazardous Effects

1. Understand the dangers presented by radioactive substances and the steps necessary to minimise the dangers.
 - 1.1 Inverse square law
 - 1.2 Shielding
 - 1.3 Time
 - 1.4 Containment

D. Preventative Measures

1. Understand the operating procedures to be followed throughout a *normal* journey as required by current regulations and approved codes of practice.
 - 1.1 Procedure at the vehicle loading point
 - 1.2 Package types and labels
 - 1.3 Stowage and load security
 - 1.4 Vehicle documents
 - 1.5 Vehicle placarding
 - 1.6 Checks before setting out
 - 1.7 Carriage of passengers
 - 1.8 Checks during journey
 - 1.9 Supervision & parking rules - when / if
 - 1.10 Action in the event of a breakdown
 - 1.11 Procedure at the vehicle unloading point
 - 1.12 Procedure on return to base

2. Understanding handling and delivery procedures.
3. Understand the use of radiation monitors.
4. Understand the action to be taken in an emergency involving a vehicle carrying radioactive materials.
5. Security awareness training.
6. Understand relevant Quality Assurance procedures.

Medical Physics Department, Cardiff and Vale University Local Health Board, February 2010

APPENDIX 4 – Example Procedure for Drivers Transporting Radiopharmaceuticals

TRANSPORT OF RADIOACTIVE MATERIAL BY ROAD

0. SCOPE & OBJECTIVE

- 0.1. Applies to all trained drivers undertaking the transport of radioactive material using public highways.
 - 0.2. To ensure compliance with the ‘Transport of Radioactive Material Policy’.
-

1. Responsibility

- 1.1. All trained drivers are responsibility for complying with these Instructions.

2. Driver Training

- 2.1. Drivers carrying radioactive packages must have undertaken the training course provided by the Medical Physics, University Hospital of Wales, Cardiff as outlined in the work instruction WI_DriverTraining.
- 2.2. On completion of this course, drivers will be issued with a certificate of attendance which they should carry within the vehicle whenever they are transporting radioactive material.

3. Prior Checks before Commencing Journey

- 3.1. Before commencement of the journey the driver must ensure that:
 - They hold a valid driving licence, training certificate and have a photo ID badge.
 - The vehicle is road worthy, taxed and fully insured.
 - There must be sufficient fuel in the vehicle to complete the delivery.
 - It is strongly advisable that the driver has a fully charged mobile phone in case of an emergency.
 - Instructions in Writing in the format of the ADR2009 are within the vehicle glove box.
 - The driver is fully familiar with the Emergency Procedure as outlined in the information document ID_EmergencyInstructionsAndDriverChecklist and what to do in the event that a package becomes undeliverable.
 - The information document ID_EmergencyInstructionsAndDriverChecklist should also be available in the vehicle to act as an aid memoir in the event of an accident or undeliverable package.
 - There is a Consignment Certificate for each package.
 - The information on the package agrees with the information entered on the consignment certificate.
 - He / she has signed for the packages on the appropriate form (see the work instruction WI_Releasing RadioactivePackages) if required.
 - All packages are labelled and stored in a suitable manner in the stowage compartment of the vehicle.
- 3.2. In addition for Excepted and Type A Packages
 - The Transport Kit (as specified in the information document ID_EmergencyInstructionsAndDriverChecklist) is placed within the stowage compartment of the vehicle. The second fire extinguisher (2kg) is located within the vehicle cabin.
- 3.3. In addition for Type A packages
 - Radioactive signs (placards) are attached to both sides and the rear the vehicle.

- A fireproof cab notice is present in the vehicle, alongside the driver, indicating the presence of radioactive material.
- 3.4. For stowage in the Medical Physics van, all packages must be secured using the friction locked webbing around the 'eye' loop within the stowage compartment and the handles of each and all the packages.

4. During the Journey

- 4.1. General responsibilities when transporting radioactive materials:
- Go straight to the destination and do not take any detours
 - Take 'reasonable' care against the theft or loss of the radioactive material carried. If dropping at more than one destination, ensure the vehicle is fully secured against any unauthorised access and inform local security staff.
 - Inform Medical Physics at UHW and the Police if loss, theft, or severe damage (examples of the latter being fire, packages bursting open leaving broken syringes on the road) of packages has occurred, in accordance with the information document ID_EmergencyInstructionsAndDriverChecklist.
- 4.2. In the event of vehicle breakdown or immobilisation, telephone Medical Physics at UHW as soon as possible.
- 4.3. Passengers are permitted providing they are fully familiar with the contents of the packages and how to instigate the emergency procedure. They would therefore be considered part of the vehicle crew. Any other passengers (e.g. patients within ambulance vehicles) are strictly prohibited.
- 4.4. Be aware of the meaning of all radioactive package signs.

5. Delivery to the Customer

- 5.1. Drivers must ensure that the consignee signs the consignment note, to prove that the package has been received.
- 5.2. Under no circumstances must a radioactive package be left without handing over the package to a suitable individual (consignee).
- 5.3. Drivers are not permitted to open packages; only the consignee may open a package and sign the consignment note.
- 5.4. If there is no one available to take receipt of the package, call the Medical Physics Department immediately for further instructions.

6. Completion of Delivery

- 6.1. When the vehicle no longer contains radioactive packages the driver must, if appropriate:
- Remove radioactive signs (placards) from the windows or the outside of the vehicle.
 - Turn the fireproof cab notice over to indicate the absence of radioactive materials.

7. Return of Empty Packages

- 7.1. Empty packages must be returned to Medical Physics with the appropriate consignment note and labelling as per instructions 1 – 6 above.

Medical Physics Department, Cardiff and Vale University Local Health Board, February 2010

APPENDIX 5 – Example of Driver’s Notes (instructions in writing) RADIOISOTOPE DELIVERIES - DRIVERS’ RESPONSIBILITIES

These guidelines have been drawn up from the requirements of the Carriage of Dangerous Goods etc Regulations 2009 (CDG2009), taking into account the type of material which we usually transport and our in-house administrative arrangements.

General

The driver is in charge of the vehicle and is responsible for the safe transport of the goods he is carrying. He should ensure that none of the material is lost, escapes or is unlawfully removed from the vehicle or from any package. All vehicle crew to wear photo ID badge.

Safety Equipment

When transporting labelled radioactive packages (Type A) make sure that the van is equipped with:

- 2 x 2kg dry powder FXs,
- one wheel chock suitable for the size of vehicle,
- 2 self-standing warning triangles
- eye-wash

and that each member of the crew is provided with:

- a hi-vis jacket (see EN 471)
- a torch
- protective gloves; and
- eye protection (e.g. protective goggles)

Guarding the Vehicle

When in a public place, the driver must not leave unattended or out of sight any vehicle containing radioactive material, without reasonable cause. If he should have to leave the vehicle, the storage compartment must be locked or the packages otherwise secured so as to prevent unlawful removal.

Stowage of Goods

The driver should ensure that the packages are not roughly treated, and are properly stowed. It is permitted to carry non-dangerous goods in the same vehicle (other dangerous goods and photographic film are not permitted). However, radioactive goods should be stowed together and not intermingled with non-radioactive goods. In a mixed load, the radioactive materials should always be to the rear of the vehicle.

Display of Placards and Notices

The driver must ensure that the fireproof warning notice is exhibited in the cab and that the vehicle placards are properly displayed (each side and rear of the vehicle). The vehicle placards or cab notice are not required when only transporting excepted packages. Excepted packages can easily be recognised as they **do not** have radiation warning signs on them.

Signing for and Hand-over of Goods

When the radioisotopes are collected from Safety Services, the driver will be given an inventory of the packages he is taking. He should check that the number of packages he receives tallies with that displayed on the inventory before signing for them. When delivering the isotopes, he should ensure that they are handed over to an authorised recipient, and that they are signed for.

NB - Always keep these instructions readily to hand. PTO for Emergency Actions.

ACTIONS IN THE EVENT OF AN ACCIDENT OR EMERGENCY

In the event of an accident or emergency that may occur or arise during carriage the vehicle crew shall take the following actions where safe and practicable to do so:

- Apply the braking system, stop the engine
- Avoid sources of ignition, in particular do not smoke or switch on any electrical equipment
- The driver must notify Emergency Control Centre, Sheffield **(0114) 2728887** immediately if he suspects that:
 - a) any radioactive material has been lost, stolen, or has escaped from the vehicle;
 - b) any package containing radioactive material has been damaged in a road accident or otherwise; or
 - c) the vehicle and its load is in danger e.g. from fire;

and give details of the radioactive material involved and any other relevant information.

- Put on the warning vests and place the self standing warning signs as appropriate
- Keep the transport documents readily available for responders on arrival
- Do not walk into or touch spilled substances and avoid inhalation of fumes, smoke, dusts and vapours by staying up wind
- Where appropriate and safe to do so, use available fire extinguishers to put out small/initial fires in tyres, brakes and engine compartment
- Fires in load compartment shall not be tackled by members of vehicle crew
- Where appropriate and safe to do so use any on-board equipment to prevent leakages and contain spillages (*can be omitted*)
- Move away from the vicinity of the accident or emergency, advise other persons to move away and follow the advice of the emergency services
- Remove any contaminated clothing and used contaminated protective equipment and dispose of it safely.



Radioactive materials being carried risk of intake and external radiation in an accident.	Limit time of exposure. Keep at a safe distance.
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