RP CoP017: Transport of Radioactive Substances

Contents

1 Scope

This Code of Practice (CoP) concerns the transport radioactive substances from University premises to other University premises or to premises out with the University. The term radioactive substances is used in this CoP to describe either radioactive material OR radioactive waste. The regulations surrounding the transport of radioactive substances are complex and persons must consult with the Radiation Protection Unit (RPU) where instructed to do so in this CoP. In broad terms, this CoP should allow trained persons, without further referring to the RPU, to:

- Classify, prepare and consign an Exempt quantity of radioactive material or waste for transport by any mode of transport; **See Section 5**
- Classify, prepare and consign an Excepted Package for transport on UK roads; and **See Section 12**
- Classify and prepare (**BUT NOT CONSIGN**) an Excepted Package for transport by Air. **See Section 13**

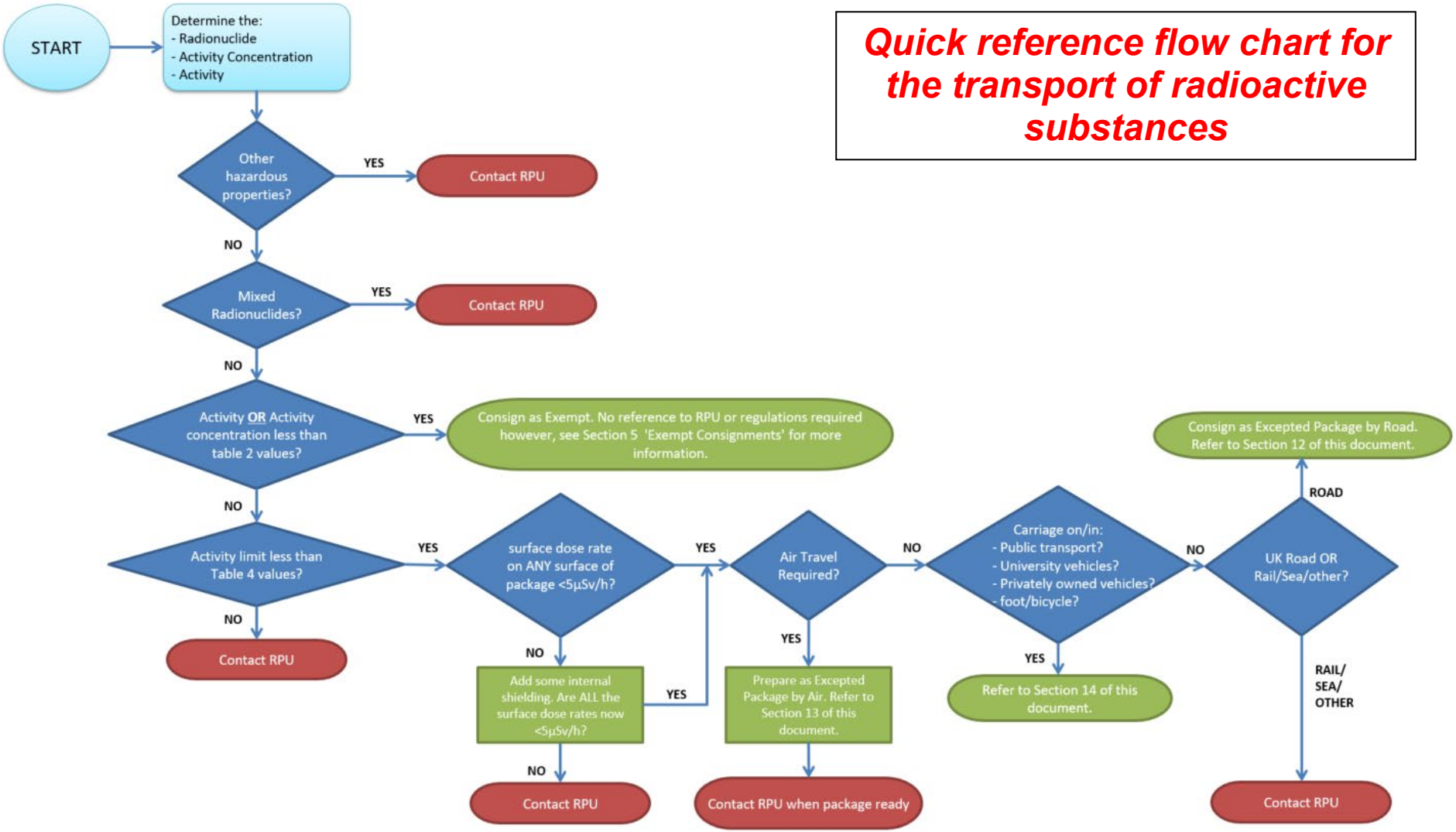
The Code of Practice also covers the basic requirements for the consignment of Type-A packages likely to be moved by the University however, Type-A packages must not be consigned for the first time without prior instruction and guidance from the RPU. The consignment of Type-A packages on a recurrent basis is managed by the local RPS and Local Rules are issued.

The content in this CoP also acts as the Radiation Protection Programme (RPP) for the University of Edinburgh and is commensurate with the levels of hazards and risk expected from the routine and occasional transport of its radioactive substances.

Persons wishing to transport radioactive substances must be suitably trained; see Section 9 for further information on training.

Persons should also ensure that they are reading the most up-to-date version of this document by checking the version number against the issued document on the CoP area of the RPU website.

Quick reference flow chart for the transport of radioactive substances



2 Introduction

The transport of radioactive substances needs to be regulated in order to prevent, as far as possible, accidents to persons or property and damage to the environment, the means of transport employed or to other goods. All UK regulations relating to the transport of radioactive substances, by whatever mode of transport, are ultimately derived from the International Atomic Energy Agency's (IAEA) Regulations for the Safe Transport of Radioactive Material. This text is then adopted by each of the different modes of transport and modal rules are written:

Mode of Transport	Regulations / Reference Text
AIR:	Technical Instructions for the Safe Transport of Dangerous Goods by Air NOTE: The Technical Instructions are further translated by the International Air Transport Association (IATA) who prepare their own Dangerous Goods Regulations (known as the IATA DGR). The IATA DGR text is used by most airlines and operators who move radioactive substances by air.
ROAD:	European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR).
SEA:	The International Maritime Dangerous Goods Code (IMDG).
RAIL:	International Carriage of Dangerous Goods by Rail (RID)
INLAND WATERWAY:	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN).

The UK government takes these modal rules and issues UK specific regulations, however, much of the UK regulations simply refer to modal reference texts above. Enforcement of the regulations is by the Office for Nuclear Regulation (Road, Rail and Inland Waterway), the Maritime and Coastguards Agency (Sea), and the Civil Aviation Authority (Air).

The University doesn't expect to routinely move radioactive substances by sea, rail or Inland Waterway so these modes of transport are not discussed further in this CoP (however, see Section 5 on Exempt consignments of radioactive substances). If you intend to move radioactive substances by sea, rail or inland-waterway you must contact the RPU for further advice.

The Modal rules, and the number of differences and subtleties within them, make for very complex reading; hence the limited scope of this CoP and the advice to contact the RPU if unsure about any part of the journey.

3 Roles and Responsibilities

Ultimately the University is responsible for implementing the rules and regulations for the radioactive substances it moves but specific duty holders involved in the transport chain of radioactive substances, and what they are responsible for, are listed below:

Table 1: Duties and responsibilities within the transport chain

Duty holder	Responsible for
The University	• Managing the Radiation Protection Programme. • Providing adequate Information, Instruction and Training to allow University personnel to carry out their duties as defined in this table.
Consignor (i.e. the 'sender')	• Packaging • Marking & Labelling • Emergency arrangements • Instructions in Writing • Consignment • Documentation • Training
Consignee (i.e. the 'receiver')	• Safe receipt of consignment
Courier/carrier (i.e. the company/ enterprise that physically carries the package/ goods from A to B).	• Stowage • Carriage • Preparation for, and dealing with, contingencies and emergencies • Driver training
Driver	• Actions to be taken in the event of an emergency

University staff or postgraduate students may act as the consignor, consignee, carrier, driver or a mixture of all or some of these duties when transporting radioactive substances.

It is important that if a 3rd party is used in the transport movement, for example a courier/carrier, the 3rd party know **exactly** what they have been contracted to do. A 'request for services' form is available as Appendix 5 to aid this division of duties.

3.1 Dangerous Goods Safety Adviser

Part 1 of the ADR introduces the carriage of dangerous goods and subsection 1.8.3 requires many of those involved in such carriage to appoint a Dangerous Goods Safety Adviser (DGSA).

There are two possible scenarios set out in ADR which may lead to an exemption from appointing a DGSA. These are set out in subsection 1.8.3.2 of ADR as follows:

a) Whose transport activities concern quantities, in each transport unit, that are smaller than those referred to in 1.1.3.6, 1.7.1.4 and in Chapters 3.3, 3.4 and 3.5 of ADR; or
b) Whose main or secondary transport activities are not the carriage or related loading or unloading of dangerous goods but occasionally engage in the national carriage or related loading or unloading of dangerous goods *posing little danger or risk to the population*.

The University is not required to consult a DGSA for its transport of Exempt or Excepted Packages as these types of packages meet 1.8.3.2.a) above.

The Office for Nuclear Regulation (ONR), who regulate the civil transport of Class 7 radioactive material in the UK, have chosen to interpret "*posing little danger or risk of pollution*" as applying ONLY to Excepted Packages.

A DGSA (Class 7) is therefore appointed by the University for the carriage of Class 7 packages (other than excepted packages). This appointment normally falls under the scope of the University's Radiation Protection Adviser.

4 Dose assessment and optimisation

The radioactive substances transported by the University could emit Alpha, Beta, Gamma or Neutron radiation. However, in almost all cases, the Alpha and Beta radiation will be stopped, or significantly reduced, by the packaging material.

The University only occasionally transports radioactive material and the majority of consignments are in Excepted Packages. The effective dose to persons transporting Excepted Packages under normal conditions of transport, and to members of the public, is most unlikely to exceed 1mSv per year and rarely come close to this. No special work patterns, detailed monitoring, dose assessment programmes or individual record keeping is therefore required.

University staff and postgraduate students transporting radioactive substances for the first time, or who are involved in the transport of Type-A packages on a recurrent basis, carry out a Transport Risk Assessment and follow Local Rules. Following the Local Rules ensures any doses are kept as low as reasonably practicable. Personal monitoring is considered on a case-by-case basis and is specified by the RPU.

5 Exempt Consignments

Firstly, users should consider whether or not the substance they intend to transport is actually classified as radioactive material or radioactive waste for the purposes of the transport regulations. A consignment may be exempt from the transport regulations if the quantity of material being carried isn't defined under the regulations as being a *radioactive substance*. All materials are, to some extent, radioactive but the various rules and regulations around the world set levels, below which, the material isn't considered to be subject to regulation. In Dangerous Goods transport this is known as *Exempt*.

Both the activity concentration **AND** the activity limit in table 2 below must be exceeded for the material or waste to be defined as being radioactive. If one isn't exceeded, the consignment is Exempt and the transport regulations surrounding the transport of radioactive substances don't reply; however, see further guidance in this section.

Users should also consider if the consignment may contain a sub-risk associated with another Dangerous Goods class; if so, contact the H&S Dept., or other local dangerous goods adviser.

Table 2: Activity limits for Exempt consignments

Radio-nuclide	Activity conc. for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)	Radio-nuclide	Activity conc. for exempt material (Bq/g)	Activity limit for exempt consignment (Bq)
H-3	1×10^6	1×10^9	**Tc-99**	1×10^4	1×10^7
C-11	1×10^1	1×10^6	**Tc-99m**	1×10^2	1×10^7
C-14	1×10^4	1×10^7	**In-111**	1×10^2	1×10^6
O-15	1×10^1	1×10^4	**I-125**	1×10^3	1×10^6
F-18	1×10^1	1×10^6	**I-129**	1×10^2	1×10^5
Na-22	1×10^1	1×10^6	**I-131**	1×10^2	1×10^6
Na-24	1×10^1	1×10^5	**Xe-133**	1×10^3	1×10^4
P-32	1×10^3	1×10^5	**Ba-133**	1×10^2	1×10^6
P-33	1×10^5	1×10^8	**Cs-137**	1×10^1	1×10^4
S-35	1×10^5	1×10^8	**Pm-147**	1×10^4	1×10^7

Radio-nuclide	Activity conc. for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)	Radio-nuclide	Activity conc. for exempt material (Bq/g)	Activity limit for exempt consignment (Bq)
Cl-36	1×10^4	1×10^6	**Eu-152**	1×10^1	1×10^6
Ca-45	1×10^4	1×10^7	**Tl-201**	1×10^2	1×10^6
Cr-51	1×10^3	1×10^7	**Tl-204**	1×10^4	1×10^4
Fe-55	1×10^4	1×10^6	**Bi-207**	1×10^1	1×10^6
Co-57	1×10^2	1×10^6	**Bi-210**	1×10^3	1×10^6
Co-60	1×10^1	1×10^5	**Pb-210**	1×10^1	1×10^4
Ni-63	1×10^5	1×10^8	**Ra-226**	1×10^1	1×10^4
Ge-68	1×10^1	1×10^5	**Am-241**	1×10^0	1×10^4
Se-75	1×10^2	1×10^6	**Cf-252**	1×10^1	1×10^4
Rb-86	1×10^2	1×10^5	**Uranium**	1×10^0	1×10^3
Sr-90	1×10^2	1×10^4	**Thorium**	1×10^0	1×10^3

Notes to Table 2: For mixed radionuclide consignments, contact the RPU for specific advice as they have to be summated using a rule specified in the relevant transport regulations.

5.1 Carriage of Exempt material on public or private transport

The transport of **Exempt** radioactive material is not regulated and so there are no specific restrictions or limitations for carriage on or in public or private transport.

In general, transport operators will include in their Terms of Carriage (or equivalent) a statement prohibiting the transport of *Dangerous Goods* on their services. In the case of radioactive substances, the definition of Dangerous Goods is taken to be whether the consignment meets the conditions of an Exempt consignment or not. By definition then, radioactive substances meeting the conditions for an Exempt consignment, are not classified as Dangerous Goods under UK or international transport legislation.

Although there are no restrictions on the carriage of exempt radioactive substances on public or private transport, it is advised that even exempt quantities are not carried on passenger aircraft due to the sensitive nature of the subject. There is a risk that persons may be refused permission to board the aircraft and it is better to consign the package as an Excepted Package by Air under Section 13.

Whilst there are no requirements from the transport regulations placed on Exempt quantities, the University provides additional advice below on packing and marking of exempt quantities and also on shipping exempt quantities of material in and out of the UK.

5.2 Packing and marking of Exempt consignments

Although Exempt consignments do not require reference to the transport regulations the RPU advise that any package transported as Exempt is:

- Marked on the **INSIDE** with the word '*RADIOACTIVE*' (this could be done with a small bit of radioactive warning tape);
- Marked on the **OUTSIDE** of the package with the consignor (i.e. sender) and consignee (i.e. recipient); and,
- Transported in a suitable receptacle. For example, if liquids are to be carried, whether exempt material or not, the RPU would expect that some absorbent material is placed inside the container. A screw top lid or similar should be used to provide containment of the material if damaged/dropped.

NO RADIATION TREFOILS OR OTHER MARKINGS IDENTIFYING THE PACKAGE AS RADIOACTIVE MUST BE ON THE OUTSIDE OF THE PACKAGE

5.3 Shipping/sending of Exempt consignments

Technically, Exempt radioactive material could be sent by ordinary post with no reference to the transport regulations; however, users should consider the risk of packages being quarantined, delayed or redirected. An increasing number of ports and airports around the world are now fitted out with sensitive radiation detection and monitoring equipment.

It is therefore not advised that Exempt material is sent by ordinary post and is instead sent as an Excepted Package using a specialist courier. This should give users sending Exempt material a greater degree of confidence that their package will get from A to B safely.

Packages being sent to the USA by post (not specialist courier) are subject to additional requirements by the US Postal Service; contact the RPU for further advice.

6 Radioactive Material Groups & Package Hierarchy

If the activity limit **AND** the activity concentration of the consignment is above the limits from table 2 then it will be defined as a Radioactive Material transport movement.

6.1 Radioactive material groups

The transport rules and regulations split radioactive substances for transport into 6 groups. The definitions for these can be found in the modal rules but only '*Other form'* and '*Special form'* are likely to be moved by the University.

- Special Form
- Low Specific Activity (LSA)
- Surface Contaminated Object (SCO)
- Fissile
- Low Dispersible Material
- Other form

Special form radioactive material is where the material is contained in such a way that, almost certainly, the material shall remain intact in the event of a transport accident/incident. There are a range of performance tests that must be complied with for special form material and the material must gain unilateral approval. Special form material should be accompanied by a certificate to demonstrate that it has passed the required performance tests. Some of the University's higher activity Sealed Sources, within their recommended working life, are supplied as Special Form approved.

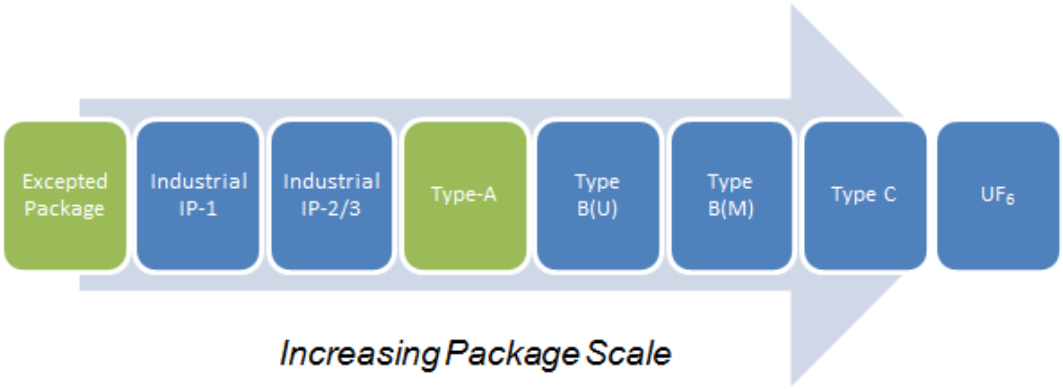
Other form material is essentially everything else not specifically described or covered by one of the groups above. Other form radioactive material accounts for the vast majority of material moved by the University.

6.2 Radioactive material package types

Package types under the regulations follow a hierarchical system with the lowest form of package, an Excepted Package, being subject to very little testing but only able to take a limited quantity of radioactive material. Packages at the top of the scale can carry huge quantities of Radioactive Material but are subject to rigorous testing.

The graphic below lists all the packages referenced in the regulations for carrying radioactive substances. Excepted Packages and Type-A packages are likely to be the only package types moved by the University.

Figure 1: Radioactive Material packaging hierarchy



The modal rules specify the requirements that must be met in order to use the various packaging types listed above. All packages used for transporting radioactive substances must meet certain general requirements on the quality of the package. Additional requirements placed on the package are then added the higher up the package hierarchy you go. The package requirements for Excepted Packages and Type-A Packages are detailed in the relevant sections of this CoP.

7 Marking and Labelling of Packages and Vehicles

The correct marking and labelling of radioactive material packages, and vehicles, for transport is a fundamental requirement of the regulations.

7.1 Marking of Packages

The marking of packages for the transport of radioactive substances essentially means the text that is used to provide specific information about that package.

Excepted Packages do not need to carry any external marks other than the letters “UN” followed by the appropriate UN number, and an identification of the consignee/consignor. A list of UN numbers is listed in the modal texts for radioactive material and are duplicated in Appendix 7. They are also required to be marked with orientation arrows, if liquids are being carried, and the gross permitted mass, if the mass of the package is in excess of 50kg.

Type-A packages must also be marked as per Excepted Packages but additionally the Proper Shipping Name, the text “Type-A”, the originating International Vehicle Registration (VRI) code, and a package sponsor identifier (e.g. maker’s mark) must appear on the package in a durable and legible format. The RPU must be consulted on the marking of Type-A packages unless this advice has already been provided.

Type IP-1, IP-2, IP-3, Type B(U)/B(M), Type-C and UF_6 packages are also subject to certain marking and labelling requirements under the modal rules but are unlikely to

be consigned by the University. Specific advice on the marking and consignment of these types of packages can be sought from the RPU.

More specific details on the marking of Excepted Packages for Road and Air transport are given in Section 12 & Section 13 respectively.

7.2 Labelling of Packages

The *labelling* of packages carrying radioactive substances refers to the diamond-shaped warning signs that use colours and symbols to identify the hazard within the package. These labels are only required to be placed on Type-A packages and above.

Radioactive substances for transport have 3 main labels, shown here above, which are either yellow or white. They also contain the dangerous goods class number and the radiation trefoil symbol. (**NOTE**: *There is actually a 4th label which covers fissile material: U-233, U-235, Pu-239, Pu-241 but excludes Natural or Depleted Uranium. It is unlikely that the University will be involved in the transport of fissile material*.)

The more red bars on the label, the higher the radiation levels being emitted from the package. Users must not put any labels on a package without first having consulted with the RPU unless they have been trained to do so.

Excepted Packages for Road transport ARE NOT required to be labelled in any way (do not confuse labelling and marking); however, Excepted Packages being transported by Air ARE required to be labelled with a specific label used only by the air industry. This label is shown in Appendix 2.

Placarding of vehicles

As well as marking and labelling packages for transport, road vehicles carrying those packages may also need to be marked and/or labelled (known as placards).

When radioactive material is carried in Type-A packages and above, a placard, like the one shown here on the right, is required to be displayed on both sides AND at the back of the vehicle. These placards must be at least 250mm x 250mm in size.

No vehicle marks or placards (labels) are required to be displayed on vehicles carrying only Excepted Packages.

In addition to the placards, orange coloured plates are also required to be displayed, on a flat surface, at the front and rear of the vehicle to indicate that dangerous goods are being carried. These are required to be 400mm x 300mm although their size can be reduced to 300mm x 120mm for small vehicles.

Alternatively, for consignments where the number of packages being transported does not exceed 10, and where the Transport Index of the consignment does not exceed 3, orange plates do not have to be displayed provided that a "Cab Notice" is displayed instead in a prominent position inside the vehicle. The text shown on the Cab Notice is very specifically stated in the Department for Transports Road Derogation No.9. Contact the RPU if you wish to use a Cab Notice instead of orange plates.

The RPU must be consulted on the placarding of vehicles, and the use of cab notices, carrying Type-A packages and above if advice has not already been provided (for example recurring regular consignments).

8 Documentation

The different modal rules specify that a consignor must produce a Transport Document for the transport of radioactive substances.

Excepted Packages are exempt from many of the documentation requirements in the modal rules; however, there are still some things that have to be recorded about the transport movement. More specific details on the documentation requirements for Excepted Packages for Road and Air transport are given in Section 12 and Section 13 respectively.

8.1 Road Transport

For Type-A packages and above, the full documentation requirements of the modal rules must be followed. There is no transport document template prescribed in the regulations, however, specified information must be shown in a specified order on any document used.

The consignor must also provide a statement regarding the actions, if any, that are required to be taken by the carrier. This statement should include things like supplementary requirements for the loading, stowage, carriage, handling and unloading of the package. It should also include emergency arrangements, including emergency contact details and any further restrictions on the mode of carriage.

The ADR transport document does not have to be signed but, as the information must be recorded on the transport document in a set order, the RPU must be contacted when preparing Transport Documents for new movements of Type-A or above packages.

8.2 Air Transport

For Type-A packages and above, the full documentation requirements of the modal rules must be followed. A *Shipper's Declaration for Dangerous Goods* (DGD) is required and the IATA regulations specify the format of this document. The DGD document splits the required information into roughly four main areas:

- Matters concerning the document itself;
- Details of the journey;
- Information about the dangerous goods; and,
- A declaration of compliance with the legal duties imposed on the shipper (consignor).

Industry practice has shown that the DGD is likely to be heavily scrutinised by cargo personnel accepting radioactive substances for transport onto aircraft. Any mistakes and/or omissions are likely to result in the package(s) being refused to board the aircraft.

The IATA regulations state that any person signing the declaration of compliance on the DGD document must have been trained on an IATA approved training course and that the training is valid. The RPU updates and maintains their IATA training to allow DGD documentation to be signed (for both Excepted Packages and Type-A packages) and must be contacted to sign off any paperwork for the air transport of radioactive material.

9 Training

The transport regulations make several references to training depending on the duties carried out. For example:

- General awareness training for those transporting Excepted Packages (and exempt consignments);
- Function-specific training for those with specific duties under the regulations (for example consignors, couriers/carriers, loaders, packers, drivers, etc.)
- Radiation awareness training for Class 7 transport;
- Security awareness training for Type-A and above package transport;
- Safety training (i.e. to know what to do in an emergency).

A stand-alone transport of radioactive substances module is included as part of the internal training courses offered by the University Radiation Protection Unit. This transport module covers all of the training requirements above, including the radiation awareness training.

Anyone wishing to transport radioactive substances must complete the relevant transport module and pass the competence assessment. Persons completing the competence assessment are provided with a certificate of training.

The transport training course is not competent authority approved but the University utilises special provision S12 in ADR which allows training courses to be developed in-house for transport activities where the no. of packages carried per consignment is less than 10 and where the Transport Index is less than 3.

At least one member of the University RPU maintains their transport training using an external training provider. This allows them to competently advise on any Type-A and above package movements related to the University's work.

10 Emergency Arrangements

Accidents involving the transport of radioactive substances can give rise to situations where prompt action is required to protect workers, members of the public or emergency services and the environment from exposure to or effects from ionising radiation as a result of the accident. The carriage of dangerous goods and use of transportable pressure equipment regulations (CDG09) was significantly amended in 2019 [CDG09(19)] to implement a European Basic Safety Standards directive from 2013 on emergency preparedness and response.

The Office for Nuclear Regulation, the competent authority for civil transport in the UK, updated their guidance such that emergency arrangements can be roughly split into three main areas:

A. **Contingency Plans** – these are required for reasonably foreseeable radiation accidents following on from the findings of the transport radiation risk assessment.
B. **Emergency Plans** – these are required for transport operations where radiation emergencies could occur from the transport of that material or waste. Note, these require more detail and planning than that which would be in the contingency plans.
C. **Instructions in Writing** – these are a requirement of ADR as an aid to the driver on the actions they should take in the event of an accident or emergency.

Further detail on each of these emergency arrangements is given below.

10.1 Incident Reporting

The University has a well-established accident and incident reporting system known as AIR where accidents/incidents can be reported online. All staff are aware of the need to report accidents and incidents through on-boarding and induction processes.

Any incidents involving the transport of radioactive substances are flagged to the Radiation Protection Unit. The RP Unit would categorise the transport incident in accordance with the ONR coding's below and take the lead in notifying the ONR Transport team via their INF1 form and notifying procedures.

University staff and students must not report to the ONR themselves without seeking advice in the first instance from the University RP Unit.

ONR Code	Description	Timing
TS01	A radiological emergency	Immediate
TS02	Theft or loss of the Class 7 goods in carriage	Immediate
TS03	Emergency arrangements have been initiated in relation to Class 7 goods even if, in the event, no intervention was made pursuant to those events.	Immediate
TS04	Release of radioactive materials or unplanned exposure to individuals.	Immediate
TS05	Degradation in package safety.	Immediate
TS06	Any other radiation or contamination limit breach.	Day
TS07	General transport non-compliance otherwise not identified.	Week
TS08	Safety significant event which did not involve a breach of regulations (near miss).	Month
TS09	The discovery of radioactive material in a shipment believed to be non-radioactive.	Month

10.2 Contingency Plans

Contingency Plans will always be required for transport of radioactive material as it is reasonably foreseeable that there could be an accident at some point during the journey. The aim of the contingency plan is to restrict exposures that arise from an accident as far as reasonably practicable.

More information on Contingency Plans is given in Appendix 6.

For the transport of Type-A packages, the model plans are adapted where necessary and incorporated into Local Rules specific to the transport movement. The model plans provides clear instructions to the driver on what to do in an emergency and must accompany every transport operation so that it is readily accessible by the driver or another person in the event of the driver being unable to take action.

Where the University acts as the consignor and carrier of radioactive material, the RPU arranges rehearsals of the contingency plans to ensure that persons involved in the plan understand their duties and know what to do in the event of an emergency. A record is kept with the RPU of these rehearsals.

Where the University acts as the consignor but NOT the carrier; i.e. the carrier services are contracted out to a third party, the RPU liaises with the third-party carrier to ensure their emergency arrangements are subject to rehearsals at suitable intervals.

10.3 Emergency Plans

Emergency Plans are required, in addition to contingency plans, in situations where radiation emergencies could occur from the transport operation.

A radiation emergency is a situation where prompt (urgent) action is required to protect members of the public, environment, etc. from serious consequences as a result of the emergency. There are likely to be NO serious consequences from an emergency where the dose to individual persons does not exceed an effective dose of 1 mSv as a result of the emergency, including the time up to 1 year after the emergency. Therefore, if the potential dose from an accident involving the radioactive substance you are carrying is not likely to exceed 1mSv (effective dose) to bystanders, responders or the environment etc. then NO emergency plans are required.

The International Atomic Energy Agency (IAEA) has produced guidance for operators to assess the potential doses to persons in the vicinity of a Type-A package which has been involved in a severe transport accident[1]. The guidance uses the 'Q' system to determine the quantity ('Q') of radioactive material that should be permitted in Type-A packages and also considered the exposure routes that could lead to a radiation dose. The five potential exposure routes used in the calculations are:

- Q_A: Gamma radiation dose
- Q_B: Beta radiation dose
- Q_C: Inhalation dose
- Q_D: skin and ingestion dose from contamination
- Q_E: submersion dose due to gaseous isotopes

However, more recent ONR Radiation Risk Assessment guidance uses a simpler estimate of when a radiation emergency is possible (1/50th of the A2 value). Table 3 below lists some radionuclides that may be transported by the University as well as

[1] IAEA Safety Standards – Advisory material for the IAEA Regulations for the Safe Transport of Radioactive Material (2012 Edition): Specific Safety Guide No.SSG-26

the 1/50th A2 relevant activity of those radionuclides which could give rise to an approximate dose of 1mSv from an accident situation.

Table 3: Activity of consignment giving rise to a possible accident dose of 1mSv in an accident situation

Radio-nuclide	1/50th ADR A2 value (GBq)	Radio-nuclide	1/50th ADR A2 value (GBq)
H-3	800	**Ge-68**	10
C-11	12	**Sr-90**	6
C-14	60	**Tc-99m**	80
F-18	12	**In-111**	60
Na-22	10	**I-125**	60
P-32	10	**I-129**	unlimited
S-35	60	**I-131**	14
Cl-36	12	**Cs-137**	12
Cr-51	600	**Eu-152**	20
Fe-55	800	**Tl-204**	14
Co-57	200	**Ra-226**	0.06 (60 MBq)
Co-60	8	**Am-241**	0.02 (20 MBq)
Ni-63	600	**$U_{nat/dep}$**	unlimited
Ga-68	10	**Th_{nat}**	unlimited

If persons are transporting more activity than the values in Table 3 above then Emergency Plans are likely to be required. The University RPU must be consulted on the adequate preparation of Emergency Plans where these are required.

The University does not normally expect to act as consignor or carrier for transport of Type-A packages where the activity transported could give rise to doses above 1mSv (i.e. a radiation emergency). The University has therefore not prepared emergency plans for any of its transport activities. There may be occasions where the activity of packages arriving into the University are higher than those in Table 3; in these cases, the University is only acting as Consignee and does not expect a radiation emergency to occur under its duties as a consignee.

On occasion, activities higher than those in Table 3 may be transported by the University, for example movement and/or disposal of Gamma Irradiators, but these are always consigned and carried by a 3rd party specialist contractor under contract who would arrange Emergency Plans where required.

10.4 Instructions in Writing

Instructions in writing are also required to be completed by the *consignor* (for Type-A packages and above) as an aid to the driver during an accident emergency situation. It is however the responsibility of the carrier to then provide these to their drivers in a language that will be understood by all members of the vehicle crew.

There is a four-page example Instructions-in-Writing in the modal rules (see section 5.4.3 of ADR) as to what details must be included in them.

Instructions in writing for the University's recurrent type-A package movements are included in the Local Rules which are carried during the movement.

11 Security Arrangements

The University Security Manager has overall responsibility and accountability for security matters at the University.

Any person transporting radioactive substances from the University shall have gone through the University's standard pre-employment checks as part of their recruitment and/or induction process and are issued with staff ID as a means of photographic identification.

Security awareness training must also be provided to those moving radioactive substances; this is done though the transport of radioactive substances training module. The aim of the security awareness training is to allow staff and postgraduate students recognise potential security risks and how they can address and reduce these risks.

The training also includes actions to be taken in the event of a security breach; these actions are included in the contingency plans in the Local Rules that accompany each Type-A transport movement.

11.1 High consequence dangerous goods

The transport of radioactive material which has the potential for misuse in a terrorist event to cause mass casualties/destruction/socio-economic disruption, otherwise known as High Consequence Dangerous Goods, is subject to additional security requirements. The activity level which takes a radionuclide into this category is very high and will always require Type-A or above transport; hence the RPU will always be involved.

Security Plans (See section 1.10.3.2.1 of ADR) are required for consignors, carriers and other participants engaged in the carriage of High Consequence Dangerous Goods. In these situations, significant advance notice of the movement is given and notified to the Radiation Protection Unit. The University Radiation Protection Adviser leads on arranging adequate Security Plans, usually through the contracted carrier, for the movement of High Consequence Dangerous Goods.

12 Transport of radioactive substances in Excepted Packages by ROAD

If the activity limit **AND** the activity concentration of the consignment is above the limits from Table 2 in Section 5 then it will be defined as a radioactive substances transport movement. The lowest type of package for carrying limited quantities of radioactive substances is an Excepted Package. Excepted Packages are still subject to some requirements of the transport regulations and the majority of radioactive substances consignments at the University are in Expected Packages.

University staff and postgraduate students should be able to *classify, prepare & consign* their own Excepted Packages for transport by road; provided that they have been on the University's (or equivalent) training course and follow the advice in this section and in the rest of the Code of Practice where required.

Remember, a Transport Radiation Risk Assessment will be required for any transport of radioactive substances. For guidance on Risk Assessment see the RPU website.

12.1 General package requirements – Excepted Packages

Excepted Packages are exempt from many of the packaging requirements in ADR however, there are some general requirements that they must meet:

- **The dose rate on ANY surface of the package must not exceed 5 micro Sieverts per hour (see Appendix 1),**
- **The external surfaces of the package must be free from contamination (see Appendix 1),**
- The mass, volume and shape of the chosen package should allow it to be carried easily and safely,
- The package must withstand routine (accident free) conditions of carriage (i.e. normal acceleration, vibration, braking etc.),
- External surfaces must be free from protruding features and easily decontaminated (cardboard boxes are ok),
- Outer layer of package should prevent the collection and retention of water (again, cardboard boxes are ok),
- The radioactive contents of the package must be compatible with the packaging material chosen,
- Any other dangerous properties of the packaged material must be considered; contact the RPU in this instance,
- For the carriage of liquids it is considered good practice to pack absorbent material (twice the volume being consigned) into the inner container. This is not always practical, for example, when consigning radioactive waste liquid scintillant.

Excepted Packages are not subject to any specific testing requirements outlined in the regulations but they must retain their contents during routine carriage; for example, a container with a screw top for transporting liquid is considered to be suitable to be able to retain the liquid contents should the package fall over during routine transport movement.

It is recommended that, to ensure the general package requirements of ADR are met, persons use UN Approved '4GV' packages to move Excepted Packages. A number of suitable suppliers are available, an example supplier is shown here:

UN Approved Boxes

If UN Approved 4GV packages are not used, persons must ensure they keep a written record showing that they have considered the general package requirements and that their chosen package meets the criteria.

12.2 Activity Limits for Excepted Packages by Road

There are four different UN numbers covering Excepted Packages but only two of the UN numbers, UN 2910 – 'Limited Quantity of Material' and UN 2911 – 'Instruments or Articles' are likely to be transported by University. The most commonly used UN number at the University is UN 2910 which relates to any radionuclide in a limited quantity.

Provided that a package can meet the general package requirements in 12.1 above, does not exceed the activity limits in Table 4 below and, can meet any other requirement in this section, it can be consigned as a UN 2910 Excepted Package.

Table 4: Activity Limits for Excepted Packages

Radio-nuclide	Solids 'Other form' (MBq)	Liquids (MBq)	Radio-nuclide	Solids 'Other form' (MBq)	Liquids (MBq)
H-3	40,000	4,000	**Tc-99**	900	90
C-11	600	60	**Tc-99m**	4,000	400
C-14	3,000	300	**In-111**	3,000	300
O-15	100	10	**I-125**	3,000	300
F-18	600	60	**I-129**	Unlimited	Unlimited
Na-22	500	50	**I-131**	700	70
Na-24	200	20	**Xe-133**	10,000 (Gas)	n/a
P-32	500	50	**Ba-133**	3,000	300
P-33	1,000	100	**Cs-137**	600	60
S-35	3,000	300	**Pm-147**	2,000	200
Cl-36	600	60	**Eu-152**	1,000	100

Radio-nuclide	Solids 'Other form' (MBq)	Liquids (MBq)	Radio-nuclide	Solids 'Other form' (MBq)	Liquids (MBq)
Ca-45	1,000	100	**Tl-201**	4,000	400
Cr-51	30,000	3,000	**Tl-204**	700	70
Fe-55	40,000	4,000	**Bi-207**	700	70
Co-57	10,000	1,000	**Bi-210**	600	60
Co-60	400	40	**Pb-210**	50	5
Ni-63	30,000	3,000	**Ra-226**	3	0.3
Ge-68	500	50	**Am-241**	1	0.1
Se-75	3,000	300	**Cf-252**	3	0.3
Rb-86	500	50	**Uranium**	Unlimited (See note 2)	
Sr-90	300	30	**Thorium**	Unlimited (See note 2)	

Notes to Table 4:

1. 'Solids – Other form' will cover the majority of consignments from the University.
2. Unlimited quantities valid for Natural Uranium, Depleted Uranium and Natural Thorium only (Solid or Liquid forms).

If the activity limits in Table 4 above are exceeded **OR,** an external surface dose rate of 5 microSv/h is exceeded on any surface, then the consignment **CANNOT** be transported as an Excepted Package unless it is:

- Shielded so the dose rate on any surface falls back below 5 microSv/h; or
- Consigned as an instrument or article (see below); or
- Consigned as special form material (see below).

Some higher activity sealed sources within their recommended working life may have special form approval. Users should contact the RPU if they think their radioactive sources may be Special Form approved and require transport.

Radioactive material which is enclosed in or is included as a component part of an instrument or article may be carried in quantities that are ten times those shown in Table 4 subject to the additional requirements/restrictions below.

The material must be classified as UN2911 – RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – INSTRUMENTS or ARTICLES and is subject to the following additional conditions:

- The dose rate of 5 microsieverts per hour at the surface does not apply to UN 2911 provided that the dose rate at 10cm from the surface of the instrument or article does not exceed 100 microsieverts per hour,

- Each manufactured instrument or article bears the word "RADIOACTIVE" on the OUTSIDE (*except radioluminescent time-pieces or devices and regulatory-approved consumer products that are marked with the word 'radioactive' on an internal surface*)
- The radioactive material is completely enclosed by non-active components.

Examples of manufactured instruments or articles (i.e. UN2911) that may be at the University are the Electron Capture Detectors (ECDs) in some Gas Chromatographs and Liquid Scintillation Counters that contain an internal standard.

12.3 Documentation for Excepted Packages by Road

Many of the documentation requirements for consigning radioactive material are waived for Excepted Packages. For road transport, a Transport Document is all that is required and it must have:

- The UN number of the consignment preceded by the letters "UN"; and
- The name and address of the consignee **AND** the consignor.

Although not a legal requirement under the transport regulations, the University recommends that certain additional information is provided on the transport documentation for Excepted Package consignments. Persons should use and complete all parts of the Transport Document template in Appendix 3 for the transport of Excepted Packages by Road and furnish the driver/carrier with a copy of the transport document. This document must be kept locally for a minimum of 3 months.

12.4 Marking and Labelling of Excepted Packages by Road

No *labels* are required on Excepted Packages but they must be *marked* with:

- the letters "UN" followed by the corresponding UN number (i.e. UN 2910),
- the consignee and/or consignor,
- Orientation arrows if liquids are being carried, and
- If the weight of the package exceeds 50kg then the permissible gross mass of the package must be shown clearly on the outside.
- the word "***Radioactive***" on the INSIDE of the package to warn persons of the presence of radioactive material immediately on opening the package. This could simply be done with a small piece of radioactive warning tape.

An example, meeting the marking requirements for an Excepted Package consigned by road under UN2910, is shown on the top half of Appendix 2.

NO OTHER LABELS OR RADIATION TREFOILS SHOULD BE ON THE OUTSIDE OF THE PACKAGE.

12.5 Additional information for Excepted Packages by Road

If persons are transporting radioactive material that could also have another dangerous property, e.g. a Radioactive Material Excepted Package where the material also has a corrosive sub-risk, then the RPU must be contacted for specific advice as the additional sub-risk must also be taken into account.

Multi-modal consignments are common, for example transport to anywhere outside the UK is likely to involve air transport with a road movement either before or after (or both). In these cases, the regulations consider that if material is packaged and consigned in compliance with one modal text then, provided that the different mode of transport occurs as part of the same journey, it will be deemed to be compliant with any of the other modal regulations. The University recommends that if there is a part of the journey involving air transport then the IATA regulations take precedence as industry feedback suggests that airlines are most likely to refuse packages for transport if not 100% IATA compliant; regardless of whether they comply with the road ADR or not. Multi-modal consignments will therefore always require RPU input to check and sign the IATA paperwork.

Up until the 31st December 2020, Council Regulation (Euratom) 1493/93 applied to the shipment of radioactive substances between EU member states. This was replaced on 1st January 2021 by the 'Shipment of Radioactive Substances (EU Exit) Regulations 2019'.

Under 1493/93, the transport of radioactive waste and sealed sources between EU member states required the consignor to obtain a prior written declaration (a 1493/93 form) from the consignee to confirm that the consignee complies with the national requirements on the safe storage, use and/or disposal of radioactive material in their country; this is now no longer required. Importers of sealed radioactive substances to the UK are still required to declare the shipment however, this is usually done by the UK agent for the sealed source supplier.

For further information about sending radioactive substances to other EU Member States contact the RPU.

13 Transport of radioactive substances in Excepted Packages by AIR

As mentioned in the Introduction section, the transport of radioactive material by air has its own set of rules.

It is intended that this section of the Code of Practice shall allow staff and postgraduate students to classify and prepare packages of radioactive material or waste for shipment by air but **NOT** to consign them. Even for Excepted Packages, the IATA modal rules require any paperwork associated with the consignment to be signed off by a person who has been on an IATA approved training course. The RPU staff have been on IATA approved training courses and can sign off the required paperwork.

Once the Excepted Package has been classified and prepared for shipment, persons must contact the RPU to sign the Transport Document and check that the consignment is ready for collection by the agent/shipper/carrier. It is likely that a member of the RPU staff will visit you, if the package is being sent from an on-campus location, to check that the package has been adequately prepared for consignment.

Remember, a Transport Radiation Risk Assessment will be required for any transport of radioactive substances. For guidance on Risk Assessment see the RPU website.

13.1 General package requirements – Excepted Packages

The package requirements for Excepted Packages being transported by air are no different to the package requirements shown in Section 12.1 above for road transport however, consideration should be given to the additional effects of air transport (i.e. temperature and pressure changes) when choosing the package material.

13.2 Activity Limits for Excepted Packages by Air

The activity limits for Excepted Packages being transported by air are equivalent to the activity limits for Excepted Packages being moved by road (See table 4 in Section 12.2).

13.3 Documentation for Excepted Packages by Air

Excepted Packages being moved by air are also exempt from many of the documentation requirements within the IATA modal rules; for example, Excepted Packages of radioactive material do not require a Shipper's Declaration for Dangerous Goods (also called a DGD) unless they have sub-risks that themselves would require the use of a DGD. There are however some subtle differences between the air and road documentation requirements; these are shown below.

For air transport of Excepted Packages, an Air Waybill, usually supplied by the carrier, is sufficient to satisfy the documentation requirements. A list of carriers that move radioactive substances can be found in Appendix 4.

The "*Nature and Quantity of Goods*" box of the Air Waybill must be filled in with:

- the letters "UN" followed by the UN number (e.g. UN 2910),
- the Proper Shipping Name (**Note:** The Proper Shipping Name (PSN) is the name and description of the material/waste covered by the UN number. PSNs are listed next to the UN number of the material that they describe in various modal texts and are shown in Appendix 7. The PSN is shown in the modal texts as upper-case characters, any lower-case characters are an optional part of the description),
- No. of packages in the consignment.

It is unlikely that University staff and postgraduate students will be in possession of, or have all the information to complete, the Air Waybill for an Excepted Package consignment of a radioactive substance by air. The completion of the Air Waybill is likely to be done by the agent/shipper/carrier contracted by the University to move the package from A to B and therefore the University needs to provide them with all the relevant information needed to do this. All the information that the shipper/agent/carrier needs to fill in the Air Waybill is contained in the Transport Document shown in Appendix 3.

It is important that University staff and postgraduate students contracting an agent/shipper/carrier to move their radioactive package(s) by air ensure that all parties know **exactly** what they have been contracted to do. A 'request for services' form is available as Appendix 5 to aid this division of duties.

As a guide, the likely duties carried out by the University and those likely to be carried out by the agent/shipper/carrier moving the radioactive material by air are shown in Table 5 below:

Table 5: Duties and responsibilities for Excepted Packages by Air

Duty holder	Responsible for	How Documented?
Agent/ Shipper/ Carrier	Transferring information from Transport Document to Air Waybill. Signing of the Air Waybill. Checking State and Operator variations for the movement to the consignee's address/location.	By Signing the Air Waybill.

Duty holder	Responsible for	How Documented?
The University	• Classifying the package • Packing • Shielding the package if required • Dose rate check • Check for contamination • Marking • Labelling (i.e. Excepted Package by air label) • Provision of a Transport Document	By completing and signing the Transport Document.

13.4 Marking and Labelling of Excepted Packages by Air

Excepted packages for air transport must be marked with:

- the letters "UN" followed by the corresponding UN number (e.g. UN 2910) **[Note]** The letters UN and the UN number must be shown on the package using a **specific label used only for the transport of Excepted Packages by air**. This label is shown for illustration purposes on the bottom half of Appendix 2 and the design must not be modified or altered in any way. The RPU has an official supply of these labels for use by anyone in the University. These can be sent out by the RPU for free. Contact the RPU if a label is required.
- the FULL name and address of the shipper (consignor),
- the FULL name and address of the consignee,
- Orientation arrows if liquids are being carried, and
- If the weight of the package exceeds 50kg then the permissible gross mass of the package must be shown clearly on the outside.
- the word "***Radioactive***" on the INSIDE of the package to warn persons of the presence of radioactive material immediately on opening the package. This could simply be done with a small piece of radioactive warning tape.

13.5 Additional information for Excepted Packages by Air

Similar additional information for air transport is included in Section 12.5 for Road transport.

14 Carriage of Excepted and Type-A Packages on public and private transport

University staff and postgraduate students may wish to personally transport radioactive material from one place to another or take public transport instead of using specialist couriers; especially with local movements between campuses. Advice on the transport of Excepted Packages and Type-A packages by public and private transport is given below.

Remember, a Transport Radiation Risk Assessment will be required for any transport of radioactive substances. For guidance on Risk Assessment see the RPU website.

14.1 Carriage of Excepted and Type-A Packages on private transport

In this case, private transport could include vehicles owned by staff, hire cars, university-owned vehicles, or by bicycle etc.

When using privately owned vehicles, University staff and postgraduate students should check the terms and conditions of their insurance. As a minimum, business insurance is likely to be needed but many insurance companies have clauses that exclude *'the carriage of Dangerous Goods'*; the carriage of Excepted and Type-A Packages **would be considered Dangerous Goods**.

The University has a motor insurance policy (for staff, not students) which includes liability against the carriage of Dangerous Goods, including radioactive material, for any motor vehicle belonging to, hired by or loaned to the University used in connection with University business. It is therefore advised that staff and postgraduate students may transport Excepted or Type-A packages in University-owned vehicles or vehicles hired by or loaned to the University. Any radioactive material moved in University-owned or hired vehicles must also meet any other applicable requirements in this CoP relating to marking, labelling, documentation, etc. for transport of radioactive material by road.

The transport of radioactive material by foot or by bicycle[2] is not regulated as walking and cycling are not referred to in Dangerous Goods legislation. Staff and postgraduate students may transport Excepted or Type-A Packages by foot or by bicycle provided that the package meets any other applicable requirements in this Code of Practice relating to marking, labelling, documentation, etc. for transport by road.

[2] For the purposes of the regulations; a bicycle is taken to be self-propelled. E-bikes would be classed as vehicles and subject to the same regulations as for cars/buses/motorcycles etc.

14.2 Carriage of Excepted and Type-A Packages on Public transport

Most public transport operators will have 'conditions of carriage' (or similar) which usually excludes the carriage of Dangerous Goods, e.g. radioactive material in Excepted or Type-A Packages, on their services. Carriage of radioactive material on public transport assumes that someone, e.g. the person consigning the radioactive material, is personally travelling with the package during its journey (rather than it being in the cargo area of a passenger train for example).

For road transport, i.e. for taxi or bus (shuttle or public), there are two specific provisions in the ADR regulations which are relevant to Excepted and Type-A packages. These are:

- Furnishing the driver/carrier with a copy of the Transport Document (1.4.2.1.1 of ADR); and,
- All personnel involved in the transport movement shall be familiar with the general requirements of the provisions for the carriage of Dangerous Goods (e.g. General awareness training as per 1.3.2.1 of ADR).

These two specific provisions, along with all the other requirements placed on Type-A Packages for segregation, loading, placarding, etc., essentially makes the transport of radioactive substances in Excepted and Type-A Packages on UK roads by public transport impractical.

The RID, concerning the international carriage of Dangerous Goods by Rail, follows closely the requirements of ADR and essentially prohibits the carriage of Class 7 radioactive material as hand luggage, registered luggage, or in/on-board passenger trains (Chapter 7.7 of RID).

The IATA DG regulations, concerning the transport of dangerous goods by air, explicitly state that Excepted Packages of radioactive material must not be carried by passengers or crew in checked (i.e. hold) baggage, carry-on (i.e. cabin) baggage or in/on their person. This also applies to Type-A Packages.

University staff and postgraduate students are therefore **NOT** advised to transport Excepted or Type-A Packages by any form of public transport. It is advised that material is either consigned using couriers who specialise in this area or by using university-owned vehicles.

15 Sending radioactive substances from external facilities

Extra care must be taken by staff or postgraduate students sending radioactive material from off-campus locations (i.e. from external research facilities or sites away from Edinburgh). This is because the University RPU are likely to be unable to check any consignments in person prior to transport.

If an external carrier/courier is used for the transport it is vital that each person understands their duties during the movement; i.e. who is responsible for packing? Who is responsible for checking the dose rate prior to the shipment and that there is sufficient shielding to meet the package limits? Who is responsible for signing the documentation and who is responsible for applying the correct marking and labelling for the package?

A 'request for services' form is available as Appendix 5 to aid this division of duties so that you can record who is taking responsibility for what.

16 Further information

Further advice on the transport of radioactive substances can be obtained from the Radiation Protection Unit of the Health and Safety Department.

17 Appendix 1: Monitoring procedures for consigning Excepted Packages

In order to correctly consign an Excepted Package for transport, it must meet, amongst others, the following conditions:

- The dose rate on the outside surface of the package must not exceed 5 µSv/h; and
- non-fixed contamination levels must be below a certain value.

This Appendix describes how to measure these conditions. The measurements should be made even for low-energy beta emitters, since it acts as a useful check that no unrecorded radionuclides have been incorrectly added to the consignment.

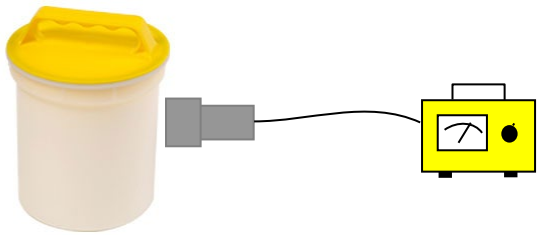
If the radiation dose rate from the package exceeds the limit above then shielding may be able to be added to the inner package to reduce the dose rate. Contact the RPU for advice on shielding.

17.1 Dose rate measurement

Where possible, dose rate measurements should be made using a radiation instrument measuring in microsieverts per hour. Contact the RPS for your area to see if you can borrow one to make a dose rate measurement of your package.

If you cannot get a hold of a suitable dose rate meter then there is a relatively simple way to measure the radiation using a Geiger-Müller detector scaled in counts per second and then applying a count-rate to dose-rate conversion factor. This will, in certain cases, over-read the true value but it will ensure packages are not consigned with dose rates in excess of the permitted level.

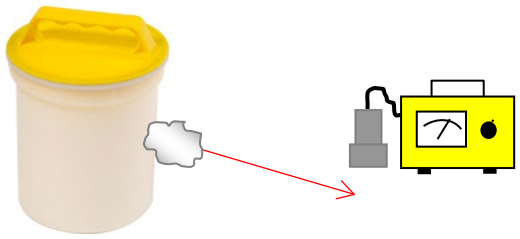
The procedure is as follows:



1) Ensure that there are no other sources of radiation in the area such that they could affect the reading on the instrument.
2) Take readings of the count rate around the package (including the base) with either a Mini Instruments type E, EL, or EP15. The detector should be held about 1 cm from the surface, making sure that nothing touches the tube end window.
3) Note down the highest reading.
4) If that reading is above the count rates in the following table, then the package may be in excess of the allowable limits. Contact the RPU for advice in this instance.

Mini Instrument type	Count Rate (c.p.s.) above background
E	10
EL	25
EP15	25

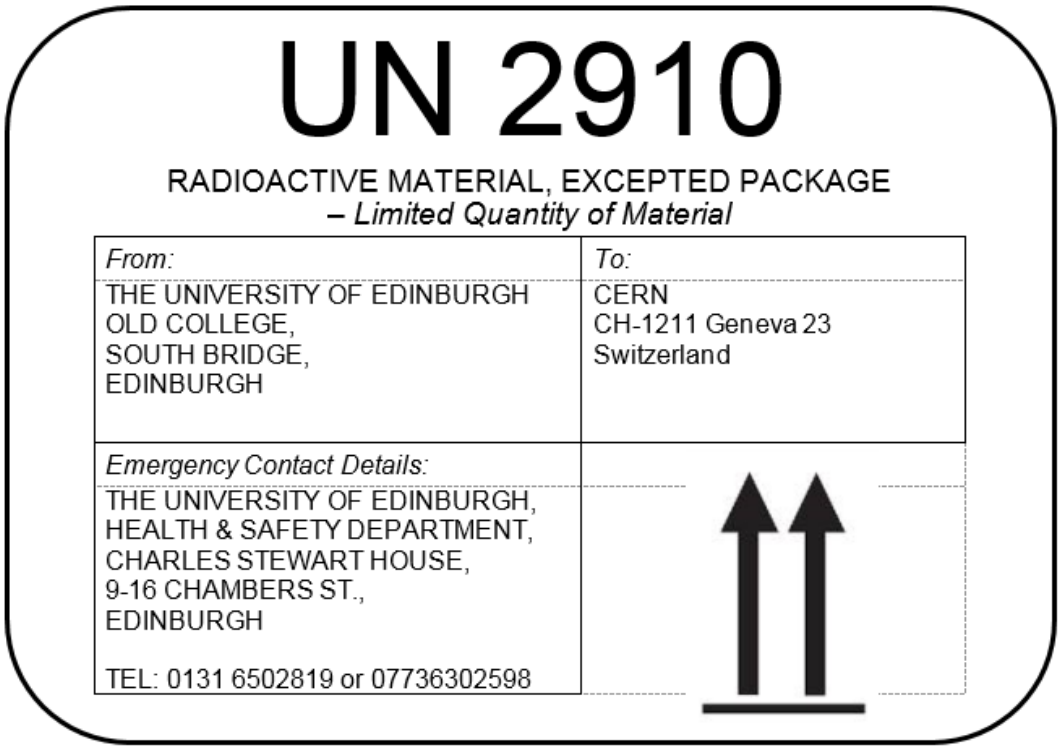
17.2 Surface contamination measurement



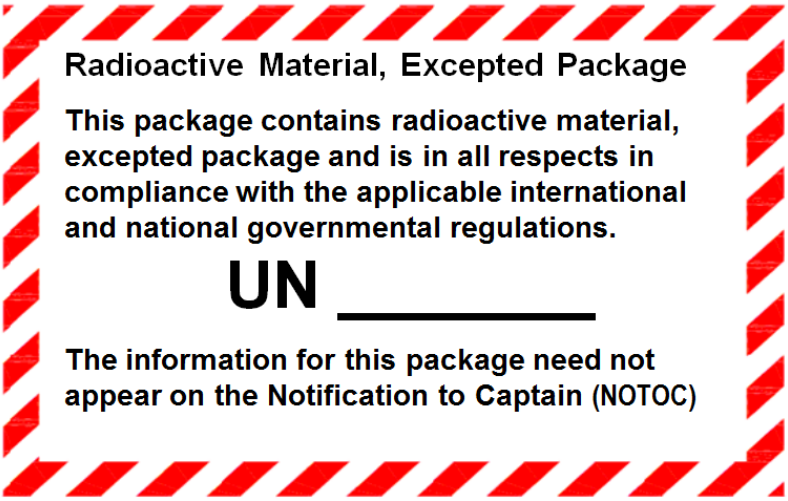
1) Using a tissue paper (or piece of filter paper) dampened with water; wipe a significant fraction of the outside of the package, including the area around the lid and the base.
2) Measure the wipe with a contamination instrument appropriate to the isotope(s) in the package. Code of Practice RP COP003 gives further information on this. Note that in the case of tritium this means using a liquid scintillation counter as opposed to a contamination instrument. For tritium, a control wipe should also be taken.
3) If the reading is more than twice background (**Note:** Twice the value of the control wipe in the case of Tritium), the package should be decontaminated and the procedure repeated until the count rate is not greater than twice background.
4) Once there is no indication of external surface contamination the package can be consigned.

18 Appendix 2: Example markings and labels for Excepted Packages

Example marking of a UN2910 Excepted Package for transport by Road.



Excepted Package label for Air Transport



Note: The excepted package label for Air transport is not, **on its own**, sufficient to meet the marking requirements for excepted packages. The road label above could be used, in addition to the air label, with the UN2910 number removed.

19 Appendix 3: Transport Document for Excepted Packages

TRANSPORT DOCUMENT FOR EXCEPTED PACKAGES

The Carriage of Dangerous Goods & Use of Transportable Pressure Equipment Regulations 2009

International Air Transport Association (IATA) Dangerous Goods Regulations

DETAILS OF CONSIGNOR (FROM):	**IN CASE OF EMERGENCY CONTACT:** **RADIATION PROTECTION UNIT** **0131 650 2818 or 0131 650 2819** **Mobile (24hr): _____**

DETAILS OF CONSIGNEE (TO):

DESCRIPTION OF LOAD: (UN No. and Proper Shipping Name)

DETAILS OF LOAD: (Physical & chemical form, radionuclide, activity)

DATE OF CONSIGNMENT:	

MAXIMUM DOSE RATE AT THE SURFACE OF ANY PACKAGE (µSv/h):	

CONSIGNOR'S DECLARATION

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name and are classified, packed, marked and labelled, and are in all respects in proper condition for transport by road or air according to the applicable international and national governmental regulations.

Name of Signatory: ----------

Position within Consignor's Organisation: ----------

Signature: ---------- Date: ----------

Download an editable copy of the Transport Document online.

20 Appendix 4: List of carriers for radioactive substance movements

A list of recommended carriers for transporting radioactive substances from university premises is shown below. These carriers have been used by the University in the past to transport radioactive substances. Persons may use other carriers not on this list, if they so wish, but it is advised that a recommended carrier is used to ensure compliance.

Company Name/web	Contact Details
Topspeed Couriers	Topspeed Couriers Limited, Unit D, Marlborough Close, Parkgate Industrial Estate, Knutsford, Cheshire WA16 8XN. TEL: 01565 631840
Hazmat Logistics Ltd	Hazmat Logistics (UK) Ltd, Unit 2, The Mill Farm Business Park, Millfield Road, Hounslow, Middlesex TW4 5PY, United Kingdom. TEL: 0208 898 1654
The Courier Company	The Courier Company (UK) Ltd, 11 James Way, Marshall Court, Milton Keynes, MK1 1SU. TEL: 08700 116611
Dangerous Goods International (DGI)	DGI HEATHROW, Unit C8, Heathrow Corporate Park, Green Lane, Hounslow TW4 6ER. TEL: 0208 814 0404
Circle Express Limited	Circle Express Limited, Building 85, Unit A, Mossland Road, Hillington Park, Glasgow, G52 4XZ. TEL: 0141 882 7822

21 Appendix 5: Transport of radioactive substances - Request for Services form

Download an editable copy of this form online.

This form may be used as a quick reference guide/checklist for those who wish to transport radioactive substances using a 3rd party carrier. It is important, prior to the consignment, to be clear on which tasks are being carried out by each party. Ultimately, the responsibility rests with the consignor (sender) for compliance with the regulations.

General Information:	
Purchase Order number:	
Name of staff member or researcher sending consignment:	
Name of company providing service:	
Are they on the University's recommended carrier list?	YES ☐ NO ☐
Contact name, email and telephone number of company providing service:	

Shipment information:	
Radionuclide:	
Activity at time of transport:	
Physical form:	Solid ☐ Liquid ☐ gas ☐ Other (specify):
Dimensions of package:	
Mode(s) of Transport:	Road ☐ Air ☐ Other ☐

Shipment information:	
Consignor (from) address:	
Consignee (from) address:	

Use the table below to record who is carrying out each task. Note, just because a task falls under the responsibility of the consignor, there is no reason why it can't be carried out by the contracted carrier/courier/etc. For example, it is the responsibility of the consignor to mark and label the package but the carrier may offer to do this as part of their service. If there are other tasks which have not been listed, and you want include these in the agreement with the contractor, record these at the end of the form.

Task	University	Contractor	N/A
1. Who is classifying the package? *i.e. who is determining the package type needed based on the radionuclide, the activity and the dose rate?*	☐	☐	☐
2. Who is checking if there are any sub-risks of the material that may need addressed?	☐	☐	☐
3. Who is choosing which package to use to transport the material?	☐	☐	☐
4. Who is physically packing the material into its transport package?	☐	☐	☐
5. Who is ensuring absorbent material is used for liquids being transported?	☐	☐	☐

Task	University	Contractor	N/A
6. If there is any shielding required to meet the package dose rate limits who is providing the shielding and checking there is enough?	☐	☐	☐
7. Who is checking the dose rate & contamination levels on the package prior to shipment?	☐	☐	☐
8. Who is marking the package for consignment?	☐	☐	☐
9. Who is labelling the package for consignment?	☐	☐	☐
10. If there is an Air Transport Excepted Package label required; who is putting this on the outside of the package?	☐	☐	☐
11. Who is preparing and completing the Transport Document?	☐	☐	☐
12. For transport by Air, who is transferring the information on the Transport Document to the Air Waybill?	☐	☐	☐
13. For transport by Air, who is signing the Air Waybill?	☐	☐	☐
14. For transport by Air, who is checking state and operator variations for the proposed movement?	☐	☐	☐
15. Who is drawing up contingency plans for reasonably foreseeable radiation accidents?	☐	☐	☐
16. Who is preparing the Instructions in Writing and providing them to the drivers	☐	☐	☐

Task	University	Contractor	N/A
in a language understood by all of the vehicle vrew?			
17. Who is checking that the package has been loaded and stowed correctly in its conveyance?	☐	☐	☐
Record any other compliance questions below...			
18.	☐	☐	☐
19.	☐	☐	☐
20.	☐	☐	☐

22 Appendix 6: Model Contingency Plans

When transporting radioactive substances, there are a number of possible incidents that could occur. However, not all will require immediate action to prevent or reduce significant exposure; i.e. not all incidents could lead to an exposure of concern and therefore require contingency plans. Some examples of scenarios when contingency plans may or may not be required are shown below; please note, this list is not intended to be exhaustive.

Incidents likely to require Contingency Plans	Incidents unlikely to require Contingency Plans
• Loss/Theft of radioactive substance • Fire in vehicle carrying Class 7 material • Major Road Accident carrying class 7 material	• Vehicle Breakdown • Minor road accident – e.g. slow speed shunt

Where the risk assessment determines a Contingency Plan is required, these must include and identify the matters in Paragraph 244 of the Ionising Radiations Regulations 2017 Approved Code of Practice.

Some examples of suitable Contingency Plans for various scenarios are shown on the Contingency Plan page of the RPU Website. These model Contingency Plans will need modified to make them relevant to your specific transport operation but they contain all the necessary matters from IRR17 Guidance Paragraph 244.

Where the Risk Assessment determines a Contingency Plan is **NOT** required, a simplified set of arrangements can be followed. Examples of steps for situations where Contingency Plans are not required are shown below:

Vehicle Breakdown
• If possible, get the vehicle off the road or over to a safe stopping place, but do not place yourself at risk from other traffic in doing so. • Warn other traffic by using the hazard warning lights and warning triangles if your vehicle is causing an obstruction. • If you are not in a safe stopping place, leave the vehicle and move to a safe place, but where you can still see the vehicle. • Leave any packages in the vehicle and secure the vehicle. • Contact your School/Department Radiation Protection Supervisor and arrange for a replacement vehicle to be sent out. • If emergency services stop to assist, inform them of the contents being carried, that a replacement vehicle is being arranged and that routine emergency arrangements are being followed.

Minor road accident (slow speed shunt - <10mph, no significant damage to loading compartment)
• If there is significant damage to the vehicle or the loading compartment or if the accident occurred >10mph there is a risk the package could be damaged – follow relevant Contingency Plan below for major road accident. • **If the above does not apply:** • If possible, get the vehicle(s) off the road or over to a safe stopping place, but do not place yourself at risk from other traffic in doing so. • Warn other traffic by using the hazard warning lights and warning triangles if your vehicle is causing an obstruction. • If you are not in a safe stopping place, leave the vehicle and move to a safe place, but where you can still see the vehicle. • Leave any packages in the vehicle and secure the vehicle. • Contact your School/Department Radiation Protection Supervisor and arrange for a replacement vehicle to be sent out. • If emergency services stop to assist, inform them of the contents being carried, that a replacement vehicle is being arranged and routine emergency arrangements are being followed.

23 Appendix 7: List of Class 7 UN Numbers

The UN Numbers relating to the transport of Class 7 radioactive substances are shown in the table below. The Proper Shipping Name (PSN) is shown as CAPITAL LETTERS; the lower-case text is optional but is often used. It is advised that persons transporting radioactive substances from university premises use all of the words in column 2 for the Proper Shipping Name. As mentioned in several places in this code of practice, the two main UN numbers transported by the University are UN2910 and UN2915; these are highlighted in the table below.

UN Number	Proper Shipping Name (PSN)
Excepted Packages:	
UN 2908	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – EMPTY PACKAGING
UN 2909	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – ARTICLES MANUFACTURED FROM NATURAL URANIUM or DEPLETED URANIUM or NATURAL THORIUM
UN 2910	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – LIMITED QUANTITY OF MATERIAL
UN 2911	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – INSTRUMENTS or ARTICLES
Low specific activity radioactive material:	
UN 2912	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I), non fissile or fissile-excepted
UN 3321	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), non fissile or fissile-excepted
UN 3322	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), non fissile or fissile-excepted
UN 3324	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE
UN 3325	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), FISSILE

UN Number	Proper Shipping Name (PSN)
Surface contaminated objects:	
UN 2913	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I or SCO-II), non fissile or fissile-excepted
UN 3326	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I or SCO-II), FISSILE
Type A packages:	
UN 2915	RADIOACTIVE MATERIAL, TYPE A PACKAGE, non-special form, non fissile or fissile-excepted
UN 3327	RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE, non-special form
UN 3332	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, non fissile or fissile-excepted
UN 3333	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, FISSILE
Type B(U) packages:	
UN 2916	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, non fissile or fissile-excepted
UN 3328	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE
Type B(M) packages:	
UN 2917	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, non fissile or fissile-excepted
UN 3329	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE
Type C packages:	
UN 3323	RADIOACTIVE MATERIAL, TYPE C PACKAGE, non fissile or fissile-excepted

UN Number	Proper Shipping Name (PSN)
UN 3330	RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE
Special arrangement	
UN 2919	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non fissile or fissile-excepted
UN 3331	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE
Uranium hexafluoride:	
UN 2977	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE
UN 2978	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non fissile or fissile-excepted
UN 3507	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, EXCEPTED PACKAGE less than 0.1 kg per package, non-fissile or fissile-excepted

Document version

Version number	Summary of change	Date and by whom
V1.0	New version	Aug 2014 Mark Green
V2.0	• Updated Flowchart • Added in Dutyholder table to clarify who is responsible for what in the transport chain	April 2015 MG
V2.1	• Minor changes (link added to RPU Codes of Practice area of website)	May 2015 MG
V3.0	• Change to note document applies to staff and postgraduate students • Changes to note arrangements for transport by private vehicle and/or public transport • Model transport contingency plans updated	October 2017 MG
V4.0	• Format moved over to UoE H&S Template – contents page added • Major re-write and tidy up of document to flow better and to put all info in one section for staff for a particular transport activity (e.g. road transport of UN2910 etc.) • Updated information on Emergency Arrangements/Plans, training, HCDG. • Section added on DGSA requirement disapplication due to the University only transporting RM on an occasional basis.	January 2021 MG
V5.0	• Minor edits throughout document. • Format moved over to a new UoE H&S Template. • Updated to note ONR Transport clarification in Jan 2023 of DGSA requirement for those transporting ANY Type-A packages regardless of frequency of transport. • Revised Table 3 Emergency Plan activities from IAEA Q-System values to 1/50th A2 values as recommended in ONR risk assessment guidance document TD-TCA-GD-003 • Addition of recommendation to use 4GV UN Approved Boxes for RS Transport • Section added to clarify reporting requirements for transport related incidents • Removal of ‘model’ contingency plan and referring out to RPU webpage on model CPs	September 2024 MG

If you require this document in an alternative format please contact The Health and Safety Department on health.safety@ed.ac.uk or call (0131) 651 4255.