Guidance Notes

August 2019

Transport and Movement of Radioactive Materials

Safety Office
HSD025R (rev 6)

UNIVERSITY OF CAMBRIDGE

Contents

1) Definition of “Transport” 3
2) Definition of Movement 3
3) Public Service Vehicles (e.g. buses, coaches, trains) 3
4) Bicycles 3
5) Inspections 4
6) Training requirements for drivers and others involved in consigning or receiving radioactive packages 4
Training matrix 5
7) Classification of Packages 6
TABLE 1: ACTIVITY LIMITS FOR EXCEPTED PACKAGES 7
TABLE 2: ACTIVITY LIMITS FOR TYPE A PACKAGES 8
8) Packaging 9
REFERENCES 12
ROUTINE and EMERGENCY contact numbers 13

Introduction

This document provides a summary of the current requirements for the *transport* by road or in other public areas, and the (site) *movement* of radioactive materials.

The relevant current legislation is 'The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (Amendments 2011, 2019) (CDG 2009). These regulations are written to implement in the UK the requirements of 'ADR 2019' ('Accord Dangereux Routier' – the European agreement concerning the international transport of dangerous goods by road). See the list of references for links to these documents.

The Ionising Radiations Regulations 2017 (IRR17), and the Environmental Permitting Regulations 2016 (EPR16) are also relevant for certain aspects of transport and movement of radioactive materials.

Road transport regulations (for radioactive substances) and other relevant radiation regulations have been in force for a number of years. The arrangements for the transport of radioactive materials (including waste) in public areas (on or off a vehicle) and the 'movement' of radioactive materials within departments and sites of the University must be in line with these regulations.

The basic philosophies behind the regulations are:

a) Package design should be such that the risk of any radioactive contamination or external radiation should be kept to a minimum.

b) All shipments should be traceable back to the sender.

c) Good quality assurance should produce public reassurance.

The following is an *outline* of the main requirements of the regulations. Further information can be obtained from the references listed at the end of this document. However, as the specific requirements are often complicated and can be confusing, please consult the Safety Office, (Radiation Protection Officer/Adviser) for the requirements for specific situations involving movement or transport.

The forms referred to throughout this document can be found on the Safety Office website http://www.safety.admin.cam.ac.uk/subjects/radiation/ionising-radiation/forms .

Key Points from the Regulations

1) Definition of "Transport"

Under ADR, transport is defined as being in a vehicle by road. "By road" includes any highway or any other road to which the public has permitted access – this would normally include any sites of the University that are unrestricted (locked gates or permanently manned barrier can be taken as the definition of 'restriction' – a warning notice, on its own, is thought not to be sufficient). Under IRR17, transport is carriage by road OR through a public place (whether on a conveyance or not), or by rail, inland waterway, sea, or air.

For transport by road, the requirements include packaging/labelling, consignment notes, driver training, quality assurance schemes and record keeping. The standards of these for vehicle transport are set down in the ADR, but IRR17 refers to the CDG Regulations for determining standards relating to non-vehicular transport in public areas. As it is not always clear as to whether the transport regulations apply, consult the RPA for any transfer of material on or off a conveyance/vehicle through any public or semi-public places. For any transfer of material through another employers premises (e.g. the hospital) the University RPA must be consulted and cooperative arrangements will be agreed with the other employer as needed.

2) Definition of Movement

Movement is defined in the Ionising Radiations Regulations as particularly applying to "site movements" and in the case of the University, movement of radioactive materials within Departments. The specific requirements are set out in IRR17 and are based on the use of "suitable receptacles, suitably labelled" whilst the substance is being moved. Suitable containment would normally be double containment.

3) Public Service Vehicles (e.g. buses, coaches, trains)

The road transport of radioactive materials by Public Service vehicles is not permitted.

4) Bicycles

Transport or movement of radioactive materials by bicycle is not permitted.

5) Inspections

Inspections of premises and vehicles may be requested and carried out by the Office for Nuclear Regulation (as well as the Health and Safety Executive) in order to check on compliance with the regulations. Included in these inspections can be the 'testing' of an organisation's Quality Assurance Programme, and Radiation Protection Programme (see 10, below). Provided employers adhere to the relevant provisions of IRR17, then the obligation for an RP programme under CDG, will be satisfied.

6) Training requirements for drivers and others involved in consigning or receiving radioactive packages

The regulations lay down special provisions relating to the carriage of radioactive materials, therefore drivers and others involved in the work must be familiar with the regulations. For drivers, this applies in so far as they affect drivers' normal duties and also the actions to be taken by the drivers in the event of emergencies. (The level of training should be appropriate to the hazard presented by the load).

In practice, the training required for the type and activities of materials transported around the University will be straightforward and could be provided at departmental level. A PowerPoint presentation is available from the Safety Office (in accordance with the requirements of sections 1-3 & 8.2 of the ADR) and an annual course is provided by the Safety Office. A similar training course is regularly held at Addenbrooke's Hospital by EARRPS. All persons who are involved in consignment of radioactive materials must have received an appropriate level of training and the training matrix below indicates levels of training appropriate to groups of people involved in transport activities. Ad hoc transport of radioactive materials by departmental staff is prohibited unless adequate instruction has been given – for the type of 'one-off' situations that occur from time to time within departments, it *may* be possible that one to one instruction could be provided by the RPSs, as agreed with the RPA. Any training should be documented.

Training matrix

TRAINING MATRIX	Those receiving radioactive materials (authorised signatories –e.g. stores/reception staff)	Consigners of radioactive material (excepted and up to 10 Type A)	Drivers of vehicles carrying radioactive material	Refresher recommended every
Relevant local procedures (refer to an induction checklist)	*Required*	*Required*	*Required*	3 years or more frequently as needed (or suitable summary)
Radioactive substances users course	*Suggested*	*Required*	*Required*	3 years or more frequently as needed
Transport course (Safety Office or EARRPS)	*Not required*	*Required*	*Required*	2-3 years
Driver awareness training (or similar)	*Not required*	*Not required*	*Suggested*	As needed

In the very unlikely event that more than 10 Type A packages (where the sum of the transport Index is greater than 3) then full vocational training (attendance at two-day course) must be provided– there is now no exception for small (less than 3.5 tonnes gross vehicle weight) vans, for these consignments.

Periodic checks (by the RPSs) on compliance will indicate the need for refresher training, but refresher training would normally be appropriate every 2-3 years.

An instruction sheet for drivers (form IR039) and an emergency arrangements sheet for drivers to follow in the event of accident or other incident (form IR040) are available on

the Safety Office website. These must be provided to drivers and used. Both documents will need customising by departments to suit local contact names/telephone numbers etc.

7) Classification of Packages

Packages transported by University personnel will almost certainly be of either 'Excepted' (i.e. excepted from *some o*f the requirements of the regulations) or 'Type A' package classifications. See tables 1 and 2 below for some examples of package limits and note the references for further information. The Safety Office must be contacted for advice regarding specific arrangements for designating and transporting radioactive packages. Very low activities or concentrations of radioactive materials *may* be completely exempt from the regulations but the Safety Office will advise.

TABLE 1: ACTIVITY LIMITS FOR EXCEPTED PACKAGES

Nuclide	***Ordinary* solid form**	**Liquid form**
C-11	600 MBq	60 MBq
C-14	3 GBq	300 MBq
Ca-45	1 GBq	100 MBq
Cl-36	600 MBq	60 MBq
Co-57	10 GBq	1 GBq
Cr-51	30 GBq	3 GBq
F-18	600 MBq	60 MBq
Fe-55	40 GBq	4 GBq
Fe-59	900 MBq	90 MBq
Ga-67	3 GBq	300 MBq
H-3	40 GBq	4 GBq
I-125	3 GBq	300 MBq
I-131	700 MBq	70 MBq
In-111	3 GBq	300 MBq
K-42	200 MBq	20 MBq
Na-22	500 MBq	50 MBq
Na-24	200 MBq	20 MBq
Ni-63	30 GBq	3 GBq
P-32	500 MBq	50 MBq
P-33	1 GBq	100 MBq
Rb-86	500 MBq	50 MBq
S-35	3 GBq	300 MBq
Xe-133	10 GBq	N/A

These activity (package contents) limits are also subject to the dose rate on any accessible surface of the excepted package not exceeding 5μSv/hr.

***Limits for "ordinary" solids are shown in the above table. For "special form" solid radioactive materials there are higher package limits – consult the Safety Office for details. For instruments containing radioactive materials the individual item limits are higher than 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 the ADR, but in the first instance consult the Safety Office.*

TABLE 2: ACTIVITY LIMITS FOR TYPE A PACKAGES

Nuclide	Special solid form	Liquid form
C-11	1 TBq	600 GBq
C-14	40 TBq	3 TBq
Ca-45	40 TBq	1 TBq
Cl-36	10 TBq	600 GBq
Co-57	10 TBq	10 TBq
Cr-51	30 TBq	30 TBq
F-18	1 Tbq	600 GBq
Fe-55	40 TBq	40 TBq
Fe-59	900 GBq	900 GBq
Ga-67	7 TBq	3 TBq
H-3	40 TBq	40 TBq
I-125	20 TBq	3 TBq
I-131	3 TBq	700 GBq
In-111	3 TBq	3 TBq
K-42	200 GBq	200 GBq
Na-22	500 GBq	500 GBq
Na-24	20 GBq	20 GBq
Ni-63	40 TBq	30 TBq
P-32	500 GBq	500 GBq
P-33	40 TBq	1 TBq
Rb-86	500 GBq	500 GBq
S-35	40 TBq	3 TBq
Xe-133	20 TBq	10 TBq

Packages whose activity exceeds the limits for excepted packages (Table 1), or whose surface dose rate exceeds 5μSv/hr, will need to be transported as Type A packages. Type A limits are shown in Table 2 above. Transport of packages exceeding Type A activity limits are unlikely in the context of work within the University, but this would need to be carried out by specialist courier.

8) Packaging

'Excepted' quantities of radioactive materials must be packaged to meet certain straightforward requirements for containment (discuss this with the Safety Office) and the surface dose rate of the package must not exceed 5μSv/hr. "Type A" quantities of materials must be transported in type-tested containers that meet the performance standards given in the regulations. Type A tested containers can be obtained from a number of manufacturers – care must be taken in purchasing type A containers and documentation must be provided by the supplier demonstrating compliance with test conditions as well as information on use, maintenance and any restrictions on the working lifetime of the container.

9) Transport (consignment) documents and labelling packages

A general consignment document to cover most categories of package is provided (form IR015) and is available on the Safety Office website.

A radioactive waste consignment document (form IR002) has also been provided and is designed to meet the requirements of the regulations but is restricted to 'excepted' quantities of material.

A suitable way of 'labelling' an 'excepted' package is by affixing a copy of the consignment note onto the outside of the package. An excepted package MUST also display the correct "UN" number (consult Safety Office), and the name of the consignor/consignee. No external signs/labels will normally be required on the outside of a vehicle transporting excepted packages.

The requirements for type A packages is more complicated, and the RPA must be consulted. The Safety Office can assist with local transport. Vehicles carrying type A packages will require the correct transport placard on three sides of the vehicle, a fireproof warning sign to be affixed in the cab, and in circumstances rarely likely to be encountered in the University, an orange "ADR" plate on the front and rear.

10) Safety Equipment and emergency arrangements

Depending on the category and quantity of packages, additional safety equipment may be required on the vehicle. The full ADR requirements include fire extinguishers, warning signs and protective clothing items for the vehicle crew. The Safety Office must be consulted on these requirements and can assist with local transport, as noted above.

Emergency arrangements as set out on drivers' instructions and in contingency plans must be rehearsed occasionally (suggested annually). Please contact the Safety Office

in the event of a transport emergency. Emergency numbers for the Environment Agency and the Office for Nuclear Regulation are noted at the end of this document.

11) Quality Assurance (QA) Plans and Radiation Protection Programs

Written QA and RP programs for the transport of radioactive material are required under the regulations. The key requirements are to have all procedures affecting ‘quality’ fully documented, to make sure that everyone involved in the process is aware of their responsibilities, and to have a system of checking to see that procedures are being observed and that corrective actions are applied, as and when required. The key procedures are, of course, packaging, labelling, training, and consignment notes, as detailed above.

The type of transport carried out within the University will require straightforward procedures proportional to the radiation risk. However, a written QA plan is required, detailing those aspects and to allay public concern regarding the transport of radioactive material. ‘Public reassurance’ is seen as one of the most important benefits of the regulations, and the requirement for a QA plan is an important element in this respect.

A QA plan for the University’s transport activities including radioactive waste collection and disposal service is held by the Safety Office – specific policy and arrangements should be documented in departments carrying out transport activities. The outline below indicates how QA should be applied to Departmental transport operations, and can be used for the development of arrangements for transport of radioactive materials. Departmental arrangements will be audited by the Safety Office periodically.

The Radiation Protection Program is essentially from the use of the Safety Office publication *‘Management of Work with Ionising Radiations in the University of Cambridge’* HSD007R, PLUS any additional radiation protection requirements specific to the department and to the materials being transported – including risk assessments relating to transport (packing, loading, driving, unloading and unpacking) radioactive materials for transport and any other arrangements at the consigning and receipt locations.

Outline Quality Assurance Plan Suitable for a University

1. General *policy statement* – provision of a transport service on behalf of or by 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 or transport between departments.
3. *Organisational Structure* – who does what and what are their responsibilities.
4. *Document Control/Records* – details of the documentation required for the transport activities and the QA programme, and of the documentation control 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 unsealed radionuclides and sealed sources

   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 (for instance the University's RPA). Annual audit is usually appropriate.
9. *Review* – The QA Programme should be regularly reviewed (at least annually) to ensure all details and referenced documentation is up to date.

Further Information

As mentioned in the text above, it is essential that specific requests for information regarding the transport of radioactive materials by or for University Departments are discussed in advance with the Safety Office RPA. However, the AURPO Guidance referred to below is a worthwhile reference for Departments who may be planning for the transport of radioactive materials by road – a copy of this document can be made available on request.

REFERENCES

1. The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations and the ADR – Both available via the HSE website http://www.hse.gov.uk/cdg/manual/adrcarriage.htm

2. The Ionising Radiations Regulations 2017 http://www.hse.gov.uk/pubns/books/l121.htm

3. 'Transport of Radioactive Materials by Road' Association of University of Radiation Protection Officers.

4. Management of work with Ionising Radiations in the University of Cambridge, HSD007R.

5. University Safety Manual, Working Safely with Unsealed Radioactive Sources, HSD010R.

6. University Safety Manual, HSD066R Working Safely with Sealed Radioactive Sources HSD066R.

The University documents referred to above can be found on the Safety Office website http://www.safety.admin.cam.ac.uk/publications . Forms referred to throughout this document are linked to the website version of this document and can also be found on the Safety Office website under the section on ionising radiation/forms http://www.safety.admin.cam.ac.uk/subjects/radiation/ionising-radiation/forms .

ROUTINE and EMERGENCY contact numbers

Please contact the University Safety Office if possible in the first instance – the Safety Office has emergency arrangements in place for transport activities. Routine advice on transport arrangements is provided by the RPA at the Safety Office.

University Safety Office Tel: 01223 333301

DGSA RoadSafe Europe Tel: 023 807 02576

Environment Agency Emergency Number Tel: 0800 807060

Office for Nuclear Regulation

	Non-Security Related Emergency	**Security Related Emergency**
Between 08.30 and 17.00 (Monday to Friday)	0151 922 5911	Contact the nominated CNSS Site inspector directly or the CNSS Duty Officer on 0330 313 5695
Out of hours	0151 922 9235	0330 313 5695

UNIVERSITY OF CAMBRIDGE

Greenwich House
Madingley Road
Cambridge CB3 0TX

Tel: 01223 333301
Fax: 01223 330256
safety@admin.cam.ac.uk
www.admin.cam.ac.uk/offices/safety

HSD025R (rev 6)