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TCSC

Transport Container Standardisation Committee

Transport of Radioactive Material Code of Practice

Safe Transport of Radioactive Material as an Excepted Package

Publisher TCSC

Note The information embodied in this document has been compiled and agreed by the TCSC. Neither the TCSC members nor their parent organisations shall be liable for any detrimental consequences resulting from following the recommendations in the document.

This Code of Practice has been prepared by the Transport Container Standardisation Committee (TCSC).

The purpose of the TCSC is "to examine the requirements for the safe transport of radioactive material with a view to standardisation and, as appropriate, produce and maintain guidance in the form of standards documentation". The TCSC began as an industry forum in the 1960's and has supported the radioactive materials transport industry for more than fifty years. In 2013 the TCSC was registered at Companies House as a company limited by guarantee.

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Comments and suggestions relating to the improvement of this Code of Practice should be addressed to the TCSC Secretariat at admin@tcsc.org.uk.

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Foreword

The Regulations for the Safe Transport of Radioactive Material, Safety Standard Series No SSR-6, 2012 Edition, require that management systems are established to cover all aspects of design, manufacture, testing, documentation, use, maintenance and inspection for all packages [306].

This code of practice has been developed to help consignors understand the requirements for transporting radioactive materials as an Excepted Package. It is suggested that the approach taken to ensure the safety of an Excepted Package should be in a standard format.

This code of practice draws on experience from the UK civil nuclear industry, but its concepts and suggestions will be equally as applicable in the medical isotope or educational sectors, and also with overseas nuclear utilities.

This document represents good practice and takes the form of recommendations.

1. General

1.1. Scope

This code of practice has been developed to help consignors understand the requirements for transporting radioactive material as an Excepted Package. It covers how to define an Excepted Package, including its contents and describes how to select a package, prepare it for shipment and how to consign it.

Excepted Packages may range from boxes carrying sources used in education to large waste containers used in transporting waste generated by decommissioning. There is a wide variety of materials used in their construction, and a wide variety of consignors some of whom only consign infrequently.

The requirements of the IAEA Transport Regulations 2012 Edition are followed and referenced where appropriate by the relevant paragraph number quoted in square brackets [ ] (Ref. 1).

This code of practice draws on experience from the UK civil nuclear industry, but its concepts and suggestions will be equally as applicable in the medical isotope or educational in sectors, and also with overseas nuclear utilities.

1.2. Definitions

Approval Authority

An organisation or an individual responsible for the approval of package designs.

Certificate of Approval (Approval Certificate)

Certificate of Approval means a certificate issued by an Approval Authority signifying that the package design fulfils the requirements of the applicable regulations.

Competent Authority

Competent Authority means any national or international regulatory body or authority designated or otherwise recognised as such for any purpose in connection with the Regulations. In the UK the Secretary of State for Transport is the Competent Authority, and the executive functions are carried out on his behalf by the Office for Nuclear Regulation.

Quality Assurance

Quality Assurance means a systematic programme of controls and inspections, applied by an organisation or body involved in the transport of radioactive material, which is aimed at providing confidence that the standard of safety prescribed in the Regulations is achieved in practice.

Regulations

Used throughout this document are defined as IAEA Safety Standard Series No. SSR-6, Regulations for the Safe Transport of Radioactive Material. Other regulations are quoted when further clarity is required e.g. ICAO, ADR, RID, CDG etc.

Obtaining approval

Regulations do not require Competent Authority approval for Excepted Packages. However, the Competent Authority is responsible for ensuring that all radioactive material packages comply with requirements of the Regulations [307] and they may at any time carry out audits on the procedures of organisations producing such packages.

2. Excepted, LSA or SCO Material?

Many consignors choose to consign radioactive material as an Excepted Package in the belief that it is the most convenient and easiest way to do so. The Excepted Package is 'excepted' from many of the regulatory requirements. The scarcity of affordable Industrial Packagings between a 205-litre drum often means that making radioactive items 'fit' the excepted criteria is the only practicable way forward.

For materials with similar activity to those permitted inside an Excepted Package, whether this has been determined from the materials' specific activity or surface contamination activity, then the consignor may wish to consider the criteria for Low Specific Activity materials (LSA-I) or Surface Contaminated Object (SCO-I). Both material types allow contact dose rates in excess of 5µSv/h. This material classification can be transported unpackaged under specific conditions, or in an Industrial Package Type I. For further information see TCSC 1078 – Approval of Radioactive Material Transport Packages which do not require Competent Authority Approval.

3. Contents

3.1. Instruments, Articles and Materials [423, 424]

There are two types of content that can be carried in an Excepted Package:

Instruments or Articles – items that have been manufactured with a radioactive source as an integral part of the item e.g. a smoke detector which has a small americium source as part of the detection system, a fire exit sign which may have a tritium source that illuminates the sign in the absence of light, a 'glow in the dark' watch that may have radium painted figures and hands or the thorium coating on some camera lenses. For articles manufactured of natural uranium, depleted uranium or natural thorium, an Excepted Package may contain any quantity of such material provided that the outer surface of the uranium or thorium is enclosed in an inactive sheath made of metal or some other substantial material. Examples include aircraft counterweights, X ray and gamma ray radiography and medical treatment devices.

Materials – solid items that are not manufactured intentionally with a radiation source in them but may have become irradiated or contaminated, or liquids and gases that contain radioactivity. Examples include liquid and planar sources, reactor components and radioimmunoassay kits.

3.2. Transport by Post [580, 581]

An Excepted Package is forbidden to be sent by post within the United Kingdom and many other countries.

3.3. Empty Packaging [427]

Empty packaging that has previously contained radioactive material can be transported as an Excepted Package if it meets the applicable conditions, including security, labelling and non-fixed contamination on the inside of the packaging.

4. Permitted Activity Allowed Inside an Excepted Package

4.1. Activity Limited [422]

Activity limits for Excepted Packages can be found in Table 4 of the Regulations. This is then crossed referenced with the nuclide(s) of interest found in Table 2. It should be noted that having determined the activity of the item to be consigned, a check of the exemption columns for the nuclides in question in columns 4 and 5 of Table 2 of the Regulations as the activity may be low enough to be considered 'Exempt' from the Regulations. Note that 'Exempt' consignments must not be confused with 'Excepted' consignments.

4.2. Activity Determination

For gases and liquids, activities can be determined in a reasonably straightforward manner by use of alpha spectrometry, beta liquid scintillation counting or gamma spectrometry. For solid items, gamma spectrometry is usually only possible, together with contamination probe counting for the beta component. Knowledge of the isotopic composition (often referred to as a 'fingerprint') is required to accurately determine the overall activity. This may be determined by measurement or by analytical means. As in SCO material activity determinations, measurement of the fixed and loose contamination together with extensive knowledge of the surface area of the object can be used to obtain a reasonably accurate activity measurement.

5. Packaging Requirements

There are many types of commercially available packages that may be suitable for use as an Excepted Package. See Appendix D. These shall meet the general requirements for all packagings and packages found in the Regulations. Guidance on the general requirements for packages is detailed below. Further guidance can be found in SSG-26 the Advisory material for the IAEA Regulations for the Safe Transport of Radioactive Material. Appendix A shows an example of a check list that can be used to assess a potential package for use as an Excepted Package and thereby meeting the quality requirements for package suitability in the Regulations [306].

Note the checklist is not intended to be used as a 'tick box' but to give a short description of how the regulations are met, this may be by referring to other documents or providing some other evidence. This may simply be 'Cardboard box as designed and supplied for carriage by courier' Mass less than 2kg. In the case of a complex packaging referring to trials conducted by shipping simulant material on a truck'

5.1. The Package to be Easily and Safely Transported [607]

The design or selection of a package should take into account its mass, volume and shape and the ease of which such a package could be easily and safely transported. This includes being easily secured on or in the conveyance.

5.2. Design for Ease of Handling and Secure Tie-down [607]

When selecting packaging for use as an Excepted Package, how easy is the package to move? Consider lifting and manual handling aspects as well as how the package will be secured in the conveyance. As a general guide, items > 25kg in weight are not suitable for lifting by one person and lifting aids may be required. These lifting aids will need to be available at the point of unloading as well as the original loading point. For further

guidance on Securing/Retention of Radioactive Material Packages on Conveyances, see TCSC 1006.

The package should also be designed so it can be lifted with its contents. This is important for large containers and heavy loads as specialist lifting equipment may need to be brought in, not only to load the container onto a vehicle, but to measure the underside dose rates.

5.3. Lifting Attachments [608]

Lifting attachments should not fail when used in the intended manner. For further guidance on Lifting Points for Radioactive Material Transport Packages, see TCSC 1079.

5.4. Attachments Not Designed to Lift Total Weight of the Package to be Made Inoperable [509]

Attachments and other features on the outside of the package that are not designed to lift the package and its contents should be rendered inoperable or removed. This means that the attachment needs to be removable, locked off or protected in some way. Signage such as '*do not lift using this handle'* may be a 'good practice' way to achieve compliance, though the sign should be secure or the information indelibly marked on the Package. However, it needs to be remembered that a sign in itself does not render a lifting point inoperable.

5.5. Design Free from Protruding Features [610]

As far as practicable, the package selected should be free from protruding features. These features may cause damage to conveyances or injuries to persons or could stress the package during moving operations. Protruding features can include sharp corners, locking mechanisms, support feet etc.

5.6. Design to facilitate Decontamination [610]

The internal and external surfaces of the package must be easily decontaminable. Selection of an appropriate construction material is a major factor here. Wood, fibreboard, metal and plastics are common materials used and all have different properties that can affect decontamination.

Regardless of the package surface, when a package is designed to be re-useable then the external surface must be kept clean and in good order. Care should be taken where previous labels and adhesive tapes have been removed, as contamination has been found on sticky residues. The package surface should therefore be capable of resisting solvents used to remove the residues.

5.6.1. Fibreboard (Cardboard)

A good quality fibreboard should be used and should be free from cuts and tears. Thought should also be given to the material being carried. Fibreboard may not be an appropriate material for liquid samples unless there is a double containment system for the sample or absorbent material (usually enough to absorb twice the volume of liquid being transported) should a spill or leak occur. Fibreboard is an easily obtainable and cheap material. However, it has limited strength that may not be suitable for heavy objects. Its strength also deteriorates when wet. Consideration should also be given to the likelihood of the package getting wet either by being left in the rain, stored in a damp warehouse/store or being transported in a vehicle with sheeted sides or perforated floors.

Many fibreboard boxes have a coating or surface finish on them to make them more waterproof than other fibreboard types. Removal of labels and tapes can remove this

coating making the box unsuitable. In general, therefore, a fibreboard box should not be considered as reusable. Should a fibreboard box be reused, however, the labels should be covered where appropriate with a blank label and sealing tapes should be left in situ and trimmed and secured.

5.6.2. Wood

Wood is often used as a material for an Excepted Package. Often it is easier to consign items to a consignee if the container that they were delivered in is still available. Wood containers often serve this purpose, but wood is not an easily decontaminable material. Rough sawn pine is definitely not decontaminable and planed wood can still absorb or hold contamination through its grain structure or knots. If wood is to be used, it should be planed, knot free as far as practicable and varnished or sealed. This also applies to internal surfaces though a liner of plastic may be an acceptable alternative.

5.6.3. Metal

Metal boxes, cans, drums or cases can make ideal Excepted Packages but they should be free from corrosion. They should have a smooth surface free from contamination traps, e.g. gouges. Where practical, the internal and external surfaces of metals susceptible to corrosion should be protected.

5.6.4. Plastic

Plastic containers can make excellent Excepted Packages. Ideally, the surface should be a smooth plastic rather than one with a rough surface. The surface should also be free from contamination traps. Unlike wood and metal surfaces, there is no need to protectively coat plastic.

5.7. Design to Shed Water

As far as practicable the design of the package shall not collect and retain water.

This is a fairly obvious consideration when using a fibreboard or wooden package but may be less so for other materials. Water can leach out any fixed contamination on the outside of the package leading to a potential breach of the limits for loose contamination. Water may also elute internal activity or give the appearance of a leaking package. In addition, other hazards can exist, especially if large containers (e.g. ISO Freight Container) are used as an Excepted Package. If these are stored outside, any collected water may freeze during cold conditions and could present a slipping hazard.

5.8. Features Added to the Package at the Time of Transport [612]

Any features added to the package to facilitate transport shall not reduce its safety. For example tools, auxiliary equipment or spare parts should not be placed on or near the package in such a manner as to impair the intended function of the packaging.

5.9. Design to Withstand Acceleration and Vibration [613]

The package shall be capable of withstanding the effects of acceleration, vibration or vibration resonance that may arise under routine conditions of transport. There should be no deterioration in the effectiveness of the closing devices on the package or in the integrity of the package as a whole nor any internal restraint system. Any nuts, bolts and securing devices should be designed to prevent them becoming loose or being released unintentionally, even after repeated use.

5.10. Materials to be compatible [614]

The materials of the packaging and any components or structures shall be physically and chemically compatible with each other and with the radioactive contents. This is important when acidified samples are carried where the external container may be metal and a spillage or leak inside the container may corrode the metal. Leak tight plastic bottles should be used in such circumstances.

Also, hazards in addition to the radiological hazard (e.g. the corrosive properties of acids) may take precedence when consigning the package. See section 8 for further details.

5.11. Valves to be Protected [615]

It is unlikely that Excepted Packages will have valves or filters associated with them. However, where such devices are in place, they should be protected to prevent unauthorised operation e.g. padlocks, blank caps etc.

5.12. Ambient Temperatures and Pressures [616]

The materials of the package should be able to withstand changes of ambient pressure and temperature likely to occur in routine conditions of transport, without impairing the essential safety features of the package.

Excepted Packages are designed to meet a set of general requirements, where it is implicit that the package should meet these requirements for a defined ambient temperature and pressure range. Excepted Packages constructed of most materials can be used without further verification. Sealed packages must be capable of resisting such pressure changes without damage or leakage of contents, or filter vents may be adopted. One way of achieving this would be a simple polythene bag with sufficient expansion volume.

An ambient temperature range of –40 to 38^{o}C and an ambient pressure range of 60 – 101 kPa are generally acceptable for surface modes of transport. For surface movements of excepted packages, ambient temperature and pressure conditions other than these may be assumed providing they can be justified and that adequate controls are in place to limit the use of the package(s) to the assumed conditions.

5.13. Shielding Requirements [617]

If the contact dose rate on the item itself is less than 5µSv/h then there is not much to consider. However, if greater than this and reliant of distance to achieve <5µSv/h at the surface of the package then solid packing such as expanded foam around the item within the package should be considered.

5.14. Requirements for Radioactive Material Having Other Dangerous Properties [507, 618]

Radioactive materials having other dangerous properties are discussed more fully in section 8.

5.15. Additional Requirements for Packages Transported by Air [619-621]

ICAO Regulations tend to be more restrictive than the IAEA requirements. An Excepted Package being transported by air is subject to further restrictions in respect of temperature and pressure.

The ambient temperature range of –40 to 55°C covers the extremes expected to be encountered during air transport and is the range required by the ICAO for packaging any dangerous goods.

In designing the containment, the effect of ambient temperature extremes on resultant surface temperatures, contents, thermal stresses and pressure variations should be considered to ensure containment of the radioactive material.

This is a similar provision to that required by the ICAO for packages containing certain liquid hazardous material intended for transport by air. Pressure reductions due to altitude will be encountered during flight. The pressure differential which occurs at an increased altitude should be taken into account in the packaging design. The pressure differential to be considered by the designer, shall not be less than the maximum normal operating pressure (MNOP) plus 95 kPa. Note for solid objects e.g. metal bars, the CAA recognise that an excepted package may not need to meet this pressure criteria (Dangerous Goods Office, Civil Aviation Authority).

5.16. Specific Additional Requirements for Fissile Materials [673-674]

Materials that are defined as fissile in accordance with the Regulations are not permitted in an Excepted Package, unless they meet the exceptions from requirements for packages containing fissile material. It should be noted that where the material contained is Fissile Excepted, the minimum permitted package dimension is 10 cm.

5.17. Use of ‘Downgraded’ Radioactive Material Packages

It is not unknown for Industrial, Type A, Type B, Type C packagings to be ‘downgraded’ to an Excepted Package to facilitate the movement of radioactive materials in a less restrictive manner than would otherwise have been possible. The package may still meet the Type requirements but where this occurs, these packages should have all labels, markings etc removed or covered in order to meet the labelling and marking requirements for an Excepted Package.

5.18. Use of ‘United Nations (UN)’ Approved Packages

The European regulations for the carriage of dangerous goods by road (ADR) and rail (RID) (Ref. 2, 4) allow other dangerous goods to be carried in ‘UN’ approved packages. These packages have been manufactured to a certain standard and although not manufactured to carry radioactive materials, they can in many cases meet the requirements for packages as set out in sections 5.1 - 5.15. See Appendix D.

6. Preparing the Package for Shipment

6.1. Pre-shipment Checks [502]

Checks shall be undertaken and recorded to ensure that all components of the Excepted Package are fit for purpose, removal or covering of old labels, touching up of worn or chipped paintwork, greasing of bolt threads. It is good practice to establish pass/fail criteria for minor defects, such as scratches, marks and or dents etc.

6.2. Maintenance [306]

6.2.1. Single Use Package

Where an Excepted Package that is intended for a single consignment, there is no need to consider periodic maintenance requirements.

6.2.2. Multiple Use Package – Periodic Maintenance

Where an Excepted Package is intended for more than one consignment, maintenance criteria should be established. Maintenance should be undertaken on a regular basis and systems put in place to ensure this maintenance is undertaken at the appropriate times and that a record of maintenance is created.

6.3. ISO Freight Container Certification

ISO Freight Containers can be used as an Excepted Package. Although an Excepted Package does not need a compliance certificate for carrying radioactive materials, if the package is an ISO Freight Container it must be certified and maintained in accordance with international ISO standards and be inspected by a qualified person (e.g. Lloyds British) and a Container Safety Certificate (CSC) issued.

Note: there are two types of inspection under the CSC. One is the CSC certificate where the container is inspected every five years and the CSC plate stamped. The other is an Approved Continuous Examination Programme (ACEP). This is a programme approved by an appropriate body in the country of ownership. This is usually identified on the CSC plate with ACEP and a country code and a reference number and is a rolling 30 month programme.

It is important before using any ISO Freight Container that the user confirms that the ISO Freight Container is within its inspection due date. This may be in the form of a hard stamp or a punched sticker that identifies the next inspection date. Or the owner may just rely on the ACEP stamp. In this instance it is worthwhile contacting the owner and either asking for the last inspection certificate for the container or a statement that the container is subject to routine inspection under the ACEP scheme.

Furthermore it is not sufficient for the consignor just to check the ISO Freight Container is within its inspection date, but also to check the general condition of the ISO Freight Container prior to use to ensure there has been no unacceptable damage whilst in use. Any questionable conditions can be checked against an acceptance criteria (e.g. the guide for container equipment Inspection, Institute of International Container Lessors) or an expert brought in.

6.4. Packaging the Material

Consideration should be given to ensuring that the material is packed safely and securely inside the package. For instance, contaminated items should be wrapped in plastic to prevent activity transferring itself onto the internal surfaces of the box. Likewise, liquids should have enough absorbent material to prevent leakage to the outside of the container if the inner receptacle is damaged or be double contained if the inner receptacle is damaged. Items with surface dose rates > 5µSv/h can be placed in large containers but the packer must make sure that it is secure and unable to move or any contamination cannot fall to the floor during normal conditions of transport and that the dose rates are attenuated by the packaging material to < 5µSv/h on the external surfaces of the package e.g by the use of expanded foam [617].

6.5. Radiation and Contamination Limits

6.5.1. Internal Radiation and Contamination [516, 508]

Internal contamination of the package should be kept to as low as reasonably practicable and when the activity from internal contamination is added to the activity of the article, instrument or material, the sum of the activities shall not exceed the limits in Table 4 of the Regulations.

The radiation level at 10cm from any point on the surface of any unpackaged instrument or article shall not exceed 0.1mSv/h **[423(a)].**

6.5.2. External Radiation and Contamination [516, 508]

The maximum contact dose rate allowed at any point on the outside of an Excepted Package is 5µSv/h.

This is a very low dose and can prove difficult to monitor in areas of high background dose rate or if the container is a large item. Many ion chamber radiation instruments can only measure down to around 2 µSv/h and consistency between different radiation instruments is an issue at these low levels and can give a different reading when checking for radiation. Additionally, large volume detectors such as ion chamber instruments can under read at these levels. Instrument selection should be done in consultation with a Radiation Protection Adviser or Supervisor to ensure that the instrument selected is appropriate for the task in hand.

Care should be taken when monitoring the package. All sides need to be measured including top and base. If the item is heavy, special lifting gear may be required to check the undersides of the package. When a dose rate of about 4 µSv/h is detected, it is recommended that a separate independent reading be taken to ensure that the 5µSv/h limit is not compromised. Consideration also needs to be given as to the likelihood of subsequent movement within the package during normal transport and the potential transgression of the 5µSv/h dose rate limit. In such cases it may be more prudent to re-classify the material and consign it in Industrial Packagings.

With large packages such as drums or ISO Freight Containers, it can be practically impossible to accurately check the dose rate over the entire package. Most radiation probes have a small cross-sectional area making it very time consuming and laborious to check the entire package. In such cases, it is recommended that large area contamination probes be used to ‘frisk’ the package and areas of high activity identified. These areas can then be checked more thoroughly with the radiation-monitoring instrument.

The maximum levels of loose contamination allowed on the external surfaces of an Excepted Package are:

- 0.4 Bq/cm^2 for most alpha nuclides,
- 4 Bq/cm^2 for all beta/gamma nuclides.

Where practicable, external surfaces should be swabbed using large area wipes to confirm the absence of loose contamination. Where loose contamination is believed to be present, levels should be checked and confirmed within limits using a Whatman 541 filter paper or similar, swabbing an area of 300 cm^2 with light finger pressure and counting the swab in a suitable counting system. A pick up factor of 10% should be assumed in the calculation of cps into Bq/cm^2.

Fixed contamination limits are not specified in the regulations but in reality, in order not to exceed the 5µSv/h contact dose rate, the fixed contamination levels will be of the same order as the non-fixed limits.

6.6. Labelling and marking [424]

6.6.1. Labels

Excepted Packages carry the following labels:

Internally – the marking 'RADIOACTIVE' on an internal surface in such a manner that a warning of the presence of radioactive material is visible on opening the package or the outside of the package, where it is impracticable to mark an internal surface. This is not required for UN 2911 where the articles are marked individually with the word 'RADIOACTIVE'.

Externally – either the Consignor's or Consignees' address, or both, legibly and durably marked and the United Nations Number – UN 2908 – 2911. There is no requirement to mark the 'Proper Shipping Name'.

UN 2908 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – EMPTY PACKAGING

Allows the transport of packages previously containing radioactive materials provided the levels of internal non fixed contamination are not above 400 Bq/cm^2 of most beta/gamma emitters and 40 Bq/cm^2 of most alpha emitters [427c]. However, it may be easier to consign as UN 2910 to avoid the need to check internal contamination levels to this degree. Also, certain containers may need to consigned as UN 2913 – Surface Contaminated Objects SCO-I due to high levels of internal contamination which may prove difficult to clean e.g. UF6 cylinders 30B and 48Y.

UN2909 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

Trefoils There is no requirement to display trefoils or Class 7 labels on the external surfaces of the package.

Air Shipment Label conforming to figure 5-29 of reference 6.

6.6.2. Gross Mass [533]

If gross mass of package > 50kg, the permissible gross mass shall be legibly and durably marked on the outside of the packaging.

7. Shipping the Package

7.1. Consignment Documentation [549, 550]

Each package shall be accompanied by a 'Transport Document' (sometimes known as a shipper's certificate, transport certificate etc). This is still required under the Carriage of Dangerous Goods etc Regulations 2009 (Ref. 5) which essentially references ADR and RID.

The certificate will document the following: -

- Name and address of Consignor plus a telephone number by which they can be contacted in the event of an accident occurring during transport of the package.
- Name and address of consignee

- UN number

Additionally, the Proper Shipping Name can be added for clarity though this is not required for ADR and RID shipments. Likewise the Consignor's declaration is not required for ADR and RID shipments. Shipment by air is also possible through use of the airwaybill. The main nuclides of interest can also be listed, but again, there is no requirement to do this.

7.2. Instructions in Writing

The package does not need to be accompanied by 'Instructions in writing'. ADR exempts this provision under ADR 1.7.1.5.1 Instructions in Writing are not required for RID shipments.

7.3. Driver Training

Special Provisions S5 and S12 of ADR Chapter 8.5 exempt drivers carrying excepted packages from the full training requirements of Chapter 8.2.1. However the basic provisions of Chapter 1.3 still apply and that, as a minimum, the driver shall have been given 'general awareness' training [313]. ADR 1.3.3 emphasises this point and also the point that proof of this training has been received.

7.4. Vehicle Placarding and Equipment

There is no requirement to placard a vehicle with the yellow/white radioactive hazard diamond or ADR Orange Plates (ADR 1.7.1.5.1). The vehicle is also exempt from carrying the equipment specified in ADR Chapter 8. CDG 2009 Approved Derogations (Ref. 7) also exempts the requirement to carry any fire fighting equipment when carrying an Excepted Package.

7.5. Emergency Response [304]

All consignors of radioactive material and carriers of radioactive materials are required to have an emergency plan and instructions for what to do in the event of an incident to a package carrying radioactive materials on public roads. NAIR (National Arrangements for Incidents involving Radioactivity) cannot be claimed as an emergency plan by any consignor or carrier. NAIR is a 'catch all' scheme designed for incidents outside of RAM transport such as a discarded source where no owner can be identified.

One example of an emergency plan that could be used should an emergency arise during the transport of the package in the UK is RADSAFE. This is operated on a mutual aid basis by, and for, the member organisations in the UK. This plan covers such items as responsibilities, provision of information, mobilisation of expert assistance at the scene of an emergency, and communications.

If the packaging is operated outside of the UK, then the user/consignor shall compile specific emergency instructions that take into account the requirements for emergency planning specified by all National Competent Authorities of the Countries through or within which the package is transported.

Although 'Instructions in Writing' are not required for excepted package consignments, the Transport Document' should have a contact number for the Consignor in order that an Emergency Response can be initiated in addition to a standard '999' call to the Emergency Services. Even though radiation doses from Excepted packages are minimal, contamination from a damaged package will still require cleaning up and it will be the Consignors responsibility to do this.

8. Excepted Packages and Additional Hazards [507]

Other dangerous properties of the contents of the package shall be taken into account when packing, transporting etc. ADR 2.1.3.5.3, RID and CDG list column 6, 3.3.1 SP 290 goes further and requires these 'other' dangerous properties to take precedence. In effect it means that the excepted package will have to be consigned as another class of dangerous goods with a sub hazard of excepted radioactive material. Hence a radioactive solution in nitric acid will have to be consigned as a Class 8 material with a class 7 sub hazard.

For the purposes of this Code of Practice, it is recommended that where such another hazard exists, the packages are consigned under the relevant requirements of ADR, RID and CDG for the primary hazard, including the obligations for packaging, labelling, placarding, documentation etc.

Appendix C gives an example of an Excepted Package shipment with a sub-hazard of dilute nitric acid and is intended to show the considerations to be made when meeting the requirements of Special Provision 290 in ADR.

9. References

1. IAEA Safety Standards Series No. SSR-6, Regulations for the Safe Transport of Radioactive Material, 2012 Edition.
2. IAEA Safety Standards Series No. SSG-26, Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material.
3. ADR – European Agreement Concerning the International Carriage of Dangerous Goods by Road 2017.
4. RID - European Agreement Concerning the International Carriage of Dangerous Goods by Rail 2017.
5. Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 S.I. 1348
6. Technical Instructions for the Safe Transport of Dangerous Goods by Air, 2017 – 2018 Edition, ICAO.
7. Carriage of Dangerous Goods – Approved Derogations and Transition Provisions April 2012

APPENDICES

Appendix A – Example of An Excepted Package Checklist

Excepted Package Checklist

Package Description:

Identification Mark:

Manufacturer's No:

Package Contents:

Requirement	Checked and by what means
Can package be easily and safely transported? (5.1)	
Can the package be properly secured on the conveyance during transport? (5.2)	
Are any lifting attachments secure? (5.3)	
Are lifting attachments capable of supporting the mass of the package? (5.4)	
Are external surfaces free from protruding features? (5.5)	
Can external surface be easily decontaminated? (5.6)	
Is outer layer of package designed to prevent the collection/retention of water? (5.7)	
Are there any features added to the package to facilitate transport that could reduce its safety? (5.8)	
Can package withstand effects of acceleration, or vibration which may arise under routine transport conditions? (5.9)	
Are nuts/bolts or securing devices designed to prevent becoming loose after repeated use? (5.9)	
Is package material compatible with the material it is due to hold (i.e. chemically compatible)? (5.10)	
Are any valves (through which radioactive material could escape) protected against unauthorised operation? (5.11)	
Does the radioactive material in the package have other dangerous properties? If yes is the package designed for this? (5.12)	
Can package withstand ambient temperatures/pressures during routine transport? (5.13)	

EXTRA BY AIR:

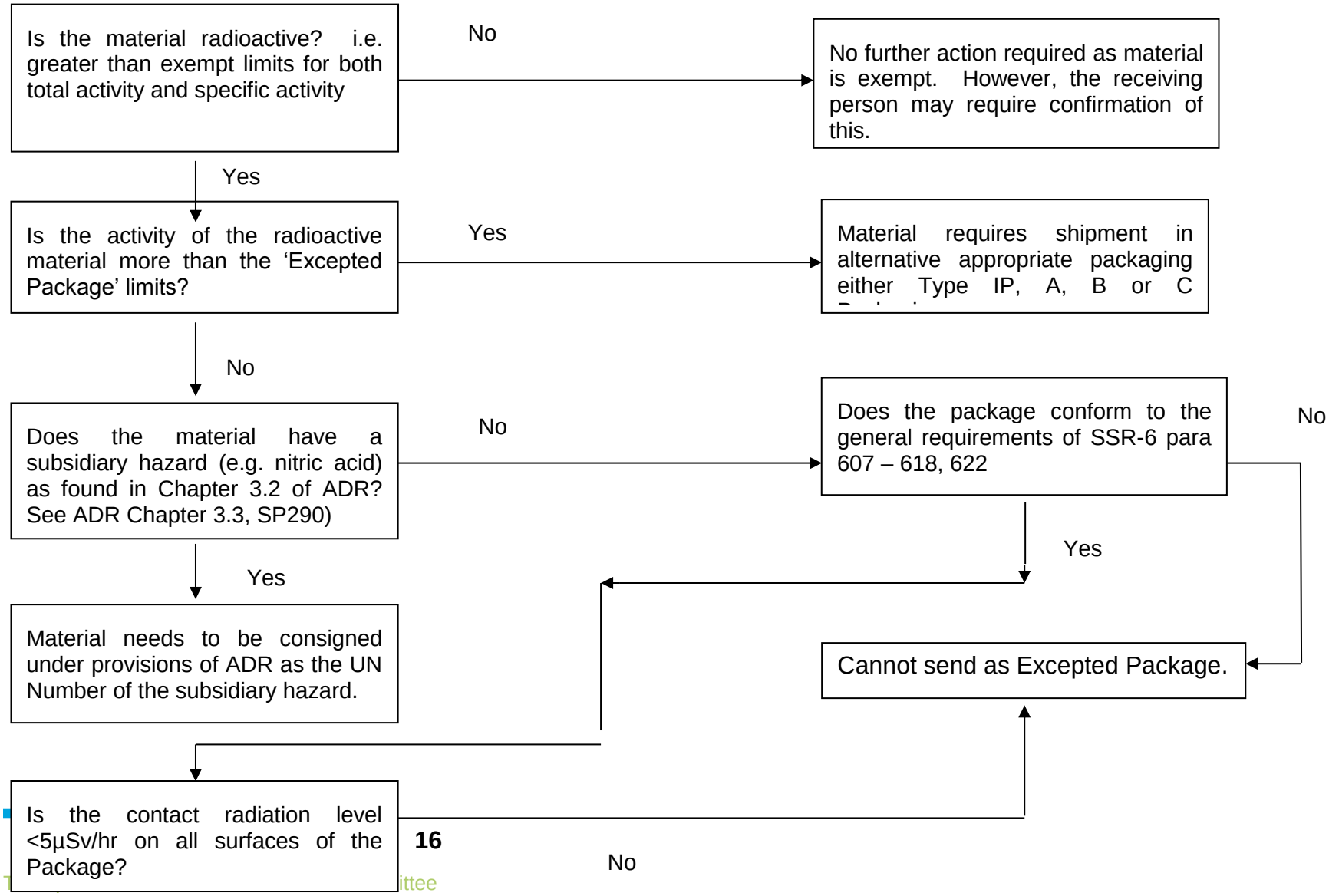
Is the package suitable for an ambient temperature range from – 40°C to + 55°C? (5.14)	
Does package have a containment system able to withstand, without leakage, a pressure differential not less than MNOP plus 95 kPa? (5.14)	

I hereby declare that the package described above meets the above general minimum requirements for the Safe Transport of Radioactive Material.

Signed:
Print Name:
Date:

Appendix B – Example of Making Shipment of an Excepted Package By Road

Figure 1 - Shipment of an Excepted Package by Road Only



Yes

Check that requirements of SSR-6 are met including:-

Loose contamination on external surfaces on Package are <0.4 Bq/cm^2 alpha and <4Bq/cm^2 beta/gamma

Check that the material is labelled 'RADIOACTIVE MATERIAL' inside package only and visible on opening. .(unless this is impracticable in which case label on outside of package)

Attach Consignee and/or Consignor address labels on outside of Package.

Mark Package with relevant UN Number (2910, 2911, 2909 or 2908 as applicable) .

Mark Package with gross mass, if >50kg

For Empty Packagings, remove or cover all previous labels and confirm non-fixed contamination on internal surfaces of Packaging are <40Bq/cm^2 alpha and <400Bq/cm^2 beta/gamma

Yes

Where practicable, Contact Consignee and obtain agreement to receive Package.

Note: Vehicle does not require any Yellow/White 'Radioactive 7' placards or Orange Plates) and CDG UK Derogations April 2012 exempts the requirement to carry fire extinguishers.

Complete Consignment Certificate.

Ensure Driver has been trained in Transport of Dangerous Goods General Awareness, it is good practice for drivers to carry evidence of training.

Hand copies of Consignment Certificate to driver along with any other pertinent information.

Excepted Package can leave Site

Appendix C – Example of the Requirements for Consigning an Excepted Package with a Sub Hazard (Dilute Nitric Acid)

Consignment of Acidified Samples as Excepted Packages – ADR Requirements

Introduction

ADR 2.1.3.5.3(a) allows radioactive materials with other hazardous properties to be consigned as Class 7 with a subsidiary risk (ADR, SP172) except where the package is identified as an Excepted Package (ADR 2.2.7.2.4.1) and has a subsidiary risk, where the subsidiary risk takes precedence (ADR, SP290). Under this provision, the sub-risk cannot be declared as Limited Quantity.

Nitric Acid (UN2031) is assigned to Packing Group I or II based on a concentration threshold of 65% in solution. Solutions significantly below this threshold, to the point that PGII is no longer relevant, can be reclassified into an appropriate collective entry (ADR 2.1.3.3).

Nitric Acid has the classification code C1 (ADR Table A column 3b) and thus would be assigned to the C1 collective entry UN3264 Corrosive Liquid, Acidic, Inorganic, N.O.S. (ADR 2.2.8.3).

Description of consignment and proper shipping name

UN No.	Name and Description *3.1.2*	Class *2.2*	Classification Code *2.2*	Label *5.2.2*	Special Provision *3.3*	Packing Group *2.1.1.3*	Packing Instruction *4.1.4*	Transport Category/ Tunnel Code *1.1.3.6 (8.6)*	Special Provisions for Carriage		
									Packages *7.2.4*	(Un)Loading/ handling *7.5.11*	Operation *8.5*
3264	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S.	8	C1	8	274	III	P001	3 (E)	V12	-	S20

NOTE 1: The number in italics under the text in the above table refers to the Chapter/ Section/ Paragraph of ADR.

Special Provisions

SP274 the provisions of 3.1.2.8 apply. i.e. it requires the PSN to be supplemented with a description of the contents

SP290 also requires the PSN to be supplemented with the excepted package description, e.g.

UN3264 Corrosive Liquid, Acidic, Inorganic, N.O.S. (contains Nitric Acid), Radioactive Material, Excepted Package - Limited Quantity of Material, 8, PGIII, (E)

Packing

The packaging should meet the requirements for the sub-risk (e.g. UN3264, Packing Instruction P001, such as UN approved drums or boxes), as well as the general requirements for an Excepted Package (ADR 6.4.4).

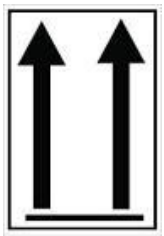
Documentation

Complete the package documentation (ADR, 5.4.1.1.1 (a) – (d) and (k)) for the sub-risk, remembering to include the:

- number and description of packages (e.g. 1x Plastic Drum);
- total quantity of each item of dangerous goods for each UN number, PSN and PG;
- name and address of the consignor and consignee

This should be complete for the sub-risk only (e.g. UN3264), unless it forms part of a mixed consignment with other dangerous goods.

Marking



The package shall be marked with the UN number of the sub-risk only (e.g. UN3264), with letters at least 12mm high. The PSN is not required.

Consignor and consignee addresses are required. The gross mass of the package is required, if over 50kg.

If using UN approved combination packaging (inners and outers) containing liquids, orientation arrows must be included on two sides of the package.

Labelling

The package shall be labelled with the sub-risks only (e.g. Class 8).

An internal surface should be marked with the words “RADIOACTIVE”. If this is impractical (e.g. a single package containing liquids) this may instead be placed on the outside of the package.

The Environmentally Hazardous Substances label should also be included, if the inner receptacles contain more than 5 litres.

Any other external labels, including radioactive labels, should be obscured or removed.

Vehicle / driver requirements

Remember: Small load exemptions only apply when the vehicle carrying your package(s), as well as any other loads from other consignors, does not exceed the thresholds as defined in ADR, Chapter 1.1.3.6.3, or as calculated in 1.1.3.6.4 where multiple transport categories are on the vehicle.

If the vehicle is only carrying UN3264, then the small load exemption limit is 1000 litres.

	*Small Load Exemption	Full Scope ADR
Placarding	N/A	Orange plates front and rear, UN Class placard
Instructions in Writing	N/A	Yes
Driver Training	General awareness for UN	Vocational training

	*Small Load Exemption	Full Scope ADR
	Class carried	certificate appropriate for UN Class carried
Vehicle Requirements	2 kg dry powder fire extinguisher (or equivalent to be produced)	All

*ADR1.1.3.6.2 provides the comprehensive list of exemptions that apply for the carriage of small loads

Appendix D – Examples of Commercial Off the Shelf (COTS) Packaging

It is not for this CoP to promote particular suppliers but there are many suppliers of COTS packaging ranging from specialists Dangerous Goods Packaging suppliers, decommissioning flexible waste bags to simple postal box suppliers.

Contact details are given; where appropriate an internet search would reveal more.

Air Sea Containers Ltd

(0)151 653 1500

Large product line from steel pails to plywood boxes and will supply in small quantities.

There are no reasons why a UN approved package can't be used.

The range covers both solids and liquids.

The advantages of buying an unused packaging form a reputable supplier is that the packaging is new, has no defects, is proven, clean and fit for purpose.

4G boxes

4GV boxes

4DV Plywood Boxes

Glass Bottles

Tinplate Inner Packagings

Plastic Bottles & Containers

Aluminium Inner Packagings

Lithium Battery Packaging

Limited Quantity Packaging

Steel drums

Composite Drums

Tinplate Drums

Infectious Substances

Temperature Controlled Packaging

Radioactive Type A Packaging

Plastic drums

Jerricans

Fibreboard drums

Vermiculite

Packaging Materials

Hazard Labels

Label line also sell UN cardboard boxes

For larger items such as tooling and where the packaging needs to be reusable, aluminium boxes such as the range shown.

This range is supplied by Kewell Converters Ltd+44 (0)1732 864 310

At the other end of the scale flexible IP-1 approved waste bags for decommissioning waste, could be used as excepted for bulk loads.

Courtesy of PACTEC EPS

01946 695005