



Transport Container Standardisation Committee

# Transport of Radioactive Material Code of Practice

Self-Assessment and Approval of  
Package Types IP-1, IP-2, IP-3 &  
Type A

**Publisher** TCSC

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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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## Foreword

The Regulations for the Safe Transport of Radioactive Material, Safety Standard Series No SSR-6, 2012 Edition, (reference 1) require that quality assurance programmes are established to cover all aspects of design, manufacture, testing, documentation, use, maintenance and inspection for all packages [306].

To facilitate the establishment of formal Quality Assurance programmes, covering the whole range of radioactive material package designs used by an organisation, the TCSC recommend in this Code of Practice that all applications for the approval of radioactive material package designs that do not require Competent Authority Approval should be in a standard format.

This TCSC code of practice was developed taking account of relevant information contained in the IAEA Draft Standard DS493 Format and Content of the Package Design Safety Report (PDSR) for the Transport of Radioactive Material (reference 2) and in consultation with TSCS members via a TSCS subgroup set up for that purpose. The IAEA graded approach has been taken into consideration as this standard is solely intended to be used for packages that do not require Competent Authority approval. This code further explains a system to be followed for the design and approval process as well as providing documentation templates to assist the user in compliance with both the regulations and assist to harmonise UK industry.

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

## 1. Introduction

This Code of Practice gives guidance on the requirements for obtaining the approval of package designs for the transport of radioactive material that do not require Competent Authority approval (Self-Assessment package types). The code has been developed for the approval of new designs or if required renewal or modification of existing designs. Self-Assessment package types within the scope of this document include:

- Industrial Package Type 1,
- Industrial Package Type 2,
- Industrial Package Type 3,
- Type A Package.

This document does not include guidance for an Excepted Package, this is given in TCSC 1089 – Transport of Radioactive Material as an Excepted Package (reference 3).

This Code of Practice is based on the IAEA SSR-6 Regulations upon which the regulations for the road, rail, sea, inland waterways and air modes of transport are based, namely ADR, RID, IMDG code, ADNR and ICAO respectively. This document provides a structure and a minimum content for a Package Design Safety Report (PDSR) to demonstrate compliance with the provisions of SSR-6 (reference 1) and (where applicable) the modal regulations

If there are any discrepancies between this document and the regulations, the requirements in the regulations shall apply.

The requirements of the IAEA Regulations for the Safe Transport of Radioactive Material 2012 Edition, Safety Requirements No. SSR-6 are followed and referenced where appropriate by the relevant paragraph number quoted in square brackets [ ] (reference 1).

The Code of Practice gives guidance on:

- (a) Self-Assessment,
- (b) Approval Process,
- (c) Regulatory requirements for IP-1, IP-2, IP-3 & Type A packages,
- (d) Format for Package Design Safety Report (PDSR),
- (e) Format for Approval Certificates,
- (f) Format and outline procedures to be followed for change control; modifications and concessions.

Note – although this code is not specifically intended to be used for proprietary approved packaging designs (i.e. those supplied by organisations other than the site licensed company intending to use the packaging) it is expected that the suppliers of such packaging will have followed this or a similar code.

In addition, and before use, the user of such a packaging must have a Certificate of Approval and Operating/maintenance instructions and satisfied himself that it can be operated safely and meets his requirements.

### 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**

The national body responsible for the legal requirements relating to safe transport of radioactive material.

For radioactive material packages used in connection with the UK Nuclear Propulsion and Weapons programmes, the Competent Authority is the Secretary of State for Defence who has delegated authority to the Defence Nuclear Safety Regulator.

In The UK the regulations are implemented by the Office for Nuclear Regulation (ONR) Transport, a section within the ONR Technical Division. ONR Transport performs a range of regulatory activities to assure the safe transport of radioactive materials. This includes granting approval for designs of packages used to carry high-hazard radioactive materials.

The ONR itself is part of the Health and Safety Executive.

**Design Number**

A number assigned to a specific packaging design, described in TCSC 1073 (reference 4). This may be issued by ONR Transport, but this is not always the case particularly for commercial organisations. See Appendix C of reference 4.

**Design Authority**

An organisation or an individual responsible for the specification and design of the packaging.

**Package Design Safety Report (PDSR)**

The Package Design Safety Report provides the documentary evidence of the compliance of the package design with the applicable regulatory requirements.

**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 SSR-6, Regulations for the Safe Transport of Radioactive Material, (2012 Edition). It should be noted that the requirements of other National and/or modal regulations also may apply and need to be considered.

## 2. Self-Assessment Process

The Self-Assessment process does in practice vary, (due to individual organisations particular practices). However, the fundamental process of package assessment cannot follow any other pathway than to address each regulatory requirement systematically. (As done by Competent Authorities for years when granting package approvals). The continued use of this CoP is intended to reduce the variation.

Whereas Competent Authorities impose one system for all package types that do require Competent Authority approval, industry uses the graded approach to determine the level of documentary evidence required as a function of the package type for self-assessed designs.

Self-Assessment package designs can be anything from a plastic bag for the transport of items for analysis or disposal, shielded bulk industrial packaging or flexible packaging for the transport of nuclear fuel debris or decommissioned plant to lightweight Type A for radiopharmaceuticals.

Each package has to be designed to ensure that it meets the requirements of the IAEA standards for the transport of radioactive material (SSR-6), any other domestic transport regulatory requirements and the ultimate requirements of the user(s).

## 2.1. Stages of Package Design to Achieve Approval

The design and approval of Packages to transport radioactive material, is consistently carried out using the following staged approach;

Stage 1 – Functional Specification (requirements, including regulatory)

Stage 2 – Concept, layout and baseline calculations

Stage 3 – Review with stakeholders

Stage 4 – Design and Analysis

Stage 5 – Testing (if applicable)

Stage 6 – Manufacturing Specification

Stage 6 – Package Design Safety Report

Stage 8 – Assessment and approval process

The assessment process will vary according to the complexity of the design and any requirement to test. A number of iterations may also be needed to achieve a satisfactory design.

The design Authority will normally lead the process and the Approval Authority (who are independent of the design authority) should be involved at review stages.

It is imperative that at all key stages the stakeholders must be consulted.

Stakeholders would typically include (but not necessarily be limited to);

Operators, maintainers, hauliers, manufacturers, health safety and human factors specialists.

It must be noted that the UK Competent Authority is responsible for assuring that all radioactive material packages comply with requirements of the Regulations [307] and they may at any time perform interventions at organisations who either design/or manufacture and approve such packages.

## 3. Requirements of Approval Process

Prior to the Package Design Safety Report (PDSR) assessment stage, it must be noted that the Approval Authority must be consulted at various stages of package design development. This is to ensure the approval process of the package design is both efficient and as timely as possible.

The points below can be used as a guide to the minimum stages for interaction between the Design Authority and the Approval Authority before PDSR submission.

Design Stages	Type IP-2, IP-3 & Type A	Type IP-1
Concept Design Stages		
Agreement that the concept design is likely to meet the requirements of the regulations for the package type	Yes	Yes
Agreement of the proposed containment system	Yes	Yes
Agreement of the proposed tests to be conducted at all of the testing stages, including at periodic maintenance intervals	Yes	No
Testing Stages		
Agreement of the proposed test plan, including drop orientation and pass criteria	Yes	N/A
Approval Authority invited to witness the tests	Yes	N/A

After testing (if applicable), the formal approval process begins. The Package Design Safety Report (PDSR) and its associated documentation (for example Operating and Handling Instructions) are required to be submitted to the Approval Authority for assessment (See section 4).

Final approval is based on the appraisal of the PDSR which is able to demonstrate compliance with the regulations. Generally, some form of Approval Certificate will be issued by the Approval Authority to signify acceptability of the design. The certificate will include references to all the principle documentation required to operate the package.

There is no regulation or guidance in the international or national legislation on the validity periods of Approval Certificates for packaging designs. Therefore, it is recommended that the duration of a Certificate of Approval for Self-Assessed packages mirror the current position adopted by the Competent Authority of five years. Note that there may be some circumstances when individual certificate validity will be shorter than five years.

Examples of this are where modal changes (on a 2-year revision cycle) may affect contents that have other hazardous properties or there have been changes to operational requirements.

Appendix D New Packaging Design Activity Schedule, shows the general work flow and participation of stakeholders an Approval Authority, during the design to approval process.

## 4. Package Design Safety Report

This section is intended to assist in the preparation of a Package Design Safety Report to demonstrate compliance of a package design for the safe transport of radioactive material against the regulatory requirements.

For each design of a package for the safe transport of radioactive material it is necessary to demonstrate compliance with the applicable national and international regulations. For packages not requiring Competent Authority approval the consignor shall be able to provide documentary evidence of the compliance of the package design with all applicable requirements.

Each package design independent of package type (within this standard) must be represented by documentary evidence that confirms compliance with all applicable regulatory requirements; such documentary evidence will be collated and called the PDSR, this must be issue or date controlled (and supported by a brief modification history).

Appendix A shows an example detailed layout of a PDSR. It should be noted that the requirements of other National and/or modal regulations also may apply and need to be considered.

The PDSR shall make reference to the Design Number, (which may have been issued by the UK Competent Authority see TCSC 1073 (reference 4) or any other unique designation such as a model number or name.

When preparing the PDSR due attention should be given to the ease of updating the document when necessary. For example a PDSR may be page, or section, controlled, so that when revisions take place only the affected pages, or sections, have the next revision letter, or number, added and are re-issued. The revision of each page, or section, should be recorded in a controlling index, and the cover page raised an issue to reflect the new issue of the document.

Where the same information applies to more than one place in the document, the information should be entered where it is considered to be most appropriate and cross referenced from other parts of the document.

An illustration or photograph shall be included within the PDSR, showing the external appearance of the package in sufficient detail to enable recognition and identification. It may be useful to include a sectional view of the package, showing relevant detail.

The supporting documents are those documents that are required to show that the package meets the regulatory requirements.

In general, these documents may fall into any of the following categories:

- (a) Drawings and Drawing List
- (b) Test Reports
- (c) Technical Reports
- (d) Calculations and analyses
- (e) Specifications (Manufacture, Procurement, Testing etc)
- (f) Operating and Handling Instructions
- (g) Maintenance Instructions
- (h) Quality Plans

The supporting documents shall be referenced within the PDSR. Copies of relevant supporting documents should be appended within the PDSR.

## 5. Certificate of Approval

The purpose of certification is to enable users to be able to demonstrate compliance has been achieved through a competent assessment of the PDSR. The certificate should be signed and dated by the Approval Authority including reference to the approval organisations address.

In SSG-26 Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (2012 Edition) (reference 5) paragraph 803.1, specific guidance is given for certification requirements for package designs not requiring competent authority approval. This should be included in self-assessment approval certificates.

## 6. Package Design Modification Approval Procedure

A modification is any change to the package design, specification, procedures or PDSR. Then, the drawings and other documents will be revised.

A modification to an existing package design shall not adversely affect the safety of the package or its compliance with the Regulations. A modification may arise from procedural improvements and/or a change in specification, or discovery of defects and/or change in specification.

Therefore, modifications shall be documented and approved by the Design Authority and Approval Authority prior to their implementation.

The Approval Authority is the final arbiter as to whether a proposed modification is in the major or minor category and with respect to minor modifications whether a revision to the PDSR is required.

### Categories of modification

To obtain approval for a modification, with a minimum of administrative delay, it is necessary to categorise modifications as major or minor and gain agreement from the Approval Authority before implementation of the change.

A major modification is one that has direct implications upon the safety of the package design. This shall require revision to the PDSR prior to approving the modification by the Approval Authority or a separate modification document detailing the changes that is approved by the Approval Authority and appended to the PDSR, which is subsequently incorporated into the PDSR.

A minor modification is one that has no direct affect upon the safety, of the package design. Notification of this modification should be distributed to all holders of the Certificate of Approval. A minor modification does not entail the amendment of a PDSR. However, an accumulation of minor modifications may warrant a revision to the PDSR.

### General

A modification which is in the major category requires the submission to the Approval Authority as described in Section 3 and will result in a reissued Certificate of Approval.

A modification which is in the minor category will be approved on the submission of a simple form which may be similar to the example shown in Appendix C.

The Approval Authority requires the following information:

- (a) the existing Package Design No,
- (b) the package title (or colloquial name),
- (c) reference number,
- (d) expiry date of current certificate,
- (e) name of applicant,
- (f) address of applicant,
- (g) telephone number of applicant,
- (h) details of proposed modification,

- (i) justification for modification, and
- (j) identification of parts of original application affected.

When the endorsed application form for a minor modification is returned it shall be attached to the/ current Certificate of Approval.

## 7. Concessions/ Production Permits

A concession is the authorisation to use a packaging which deviates from drawings or specification in some respect which does not affect its integrity or safety. A concession may apply to a single unit (or batch) and is as a result of the deviation from specification being discovered after a process is complete.

A Production permit is pre-authorisation to deviate from specification when it is realised before the process starts that the specification cannot be met.

Each concession or production permit should be reviewed, and a decision made whether it is necessary to modify the specifications to avoid reoccurrence.

A change is not a concession if it requires a change to the design, specification, procedures or PDSR. For example, a damaged thread may be replaced by a thread insert under a concession. The as-built records would be updated with the concession, but the drawings would still call up the original thread specification. However, if the thread was damaged because of poor design and the fixing arrangement need to be changed for each package of that design then that would be a modification.

The requirements for a concession or production permit may be recognised during manufacture, maintenance or while in service.

Concessions will be documented and approved by the Design Authority prior to their implementation and copied to the Approval Authority.

## 8. References

1. IAEA Specific Safety Requirements No. SSR-6, Regulations for the Safe Transport of Radioactive Material, 2012 Edition.
2. IAEA DS493 Format and Content of the Package Design Safety Report (PDSR) for the Transport of Radioactive Material, June 2016.
3. TCSC 1089 - Safe Transport of Radioactive Material as an Excepted Package.
4. TCSC 1073 - Format for Supplementary Labelling of Packages used for the Safe Transport of Radioactive Material.
5. IAEA Specific Safety Guide No. SSG-26 Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material 2012 Edition
6. TCSC 1079 - Lifting Points for Radioactive Material Transport Packages.
7. TCSC 1006-The Securing/Retention of Radioactive Material Packages on Conveyances.
8. Application of Climate Study to Class 7 Dangerous Goods package design.
9. MET office report on environmental conditions in the UK.
10. TCSC 1096 - Testing of Package Types IP-2, IP-3 and Type A Packages.
11. TCSC 1056 - Shielding Integrity Testing of Radioactive Material Transport Packaging.

12. TCSC 1090 - The Design, Manufacture, Approval and Operation of an ISO Freight Container for use as an Industrial Package Type 2 (IP-2).

ONR web site link for guidance notes on Transporting Radioactive material is;

<http://www.onr.org.uk/transport/guidance.htm>

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## Appendix A – Format for Package Design Safety Report

Notes – this template may be modified to suit a particular organisation’s issue and modification procedure, Part 1 is likely to be a single document (and may stand alone).

PART 2 is a collection of supporting information. It will comprise drawings, specifications, data sheets, calculations, test and inspection reports etc. As such each one of those documents are likely to have individual references and issues and may have been produced by a variety of organisations.

### Cover Page

<b>Title</b>	Package Design Safety Report for Type x Package Design No GB/xxxxx	<b>Number</b>	PDSR GBxxxxx
		<b>Issue</b>	
		<b>File Ref.</b>	PDSR-GB-xxxxxx-IP2.doc
<b>Compiled</b>	<i>(Signature)</i>	<b>Checked</b>	<i>(Signature)</i>
	<i>(Insert Name)</i>		<i>(Insert name)</i>
<b>Approved</b>	<i>(Signature)</i>	<b>Date</b>	<i>(Insert Date)</i>
	<i>(Insert Name)</i>		
<i>(Insert Name, Address and Telephone number)</i>			

### Issue Modification Record

Document Issue	Notes

## PART 1

### 1. Introduction

This Package Design Safety Report (PDSR) specifies the referenced package and the manufacturing and operational procedures and addresses and all the relevant requirements of the IAEA Regulations for the Safe Transport of Radioactive Material as set out in Safety Standard Series SSR-6 (2012 Edition). The IAEA regulations which correlate with any requirement identified in this report, is contained in square brackets [ ].

Where appropriate the requirements of other National and/or modal regulations are included.

The reference number and issue letter on the cover fully specifies the latest issue of the whole report.

Supporting documents for the Package Design Safety Report are listed in Part 2

### 2. Administration Information

#### 2.1. Packaging Designation

Colloquial name	<i>(Text to be added)</i>
Package Design No	<i>(Text to be added)</i>
Package Serial No(s)	<i>(Text to be added if applicable)</i>
Inner Container Design No	<i>(Text to be added if applicable)</i>

#### 2.2. Package Description and Use

##### 2.2.1. Package

*(Text to be added)*

##### 2.2.2. General Nature of Radioactive Contents

*(Text to be added)*

##### 2.2.3. General Use

*(Text to be added)*

##### 2.2.4. Particular Requirements

*(Text to be added)*

#### 2.3. State Type of Approval required

*(Text to be added)*

#### 2.4. Modes of Transport

**2.4.1. Modes (Road, Rail, Sea, Air, Inland Waterway) [836(d)]**

*(Text to be added)*

**2.4.2. Restrictions on Type of Vehicles to be Used**

*(Text to be added)*

**2.5. Relevant Names and Contact Details**

**2.5.1. Design Authority**

**2.5.2. Manufacturer**

**2.5.3. Operator**

**2.5.4. Maintainer**

**2.6. Applicable Management System Programmes**

**2.6.1. Design, Manufacture, Testing, Documentation, Use, Maintenance and Inspection [306]**

*(Text to be added)*

**3. Specification of Permitted Radioactive Contents**

**3.1. General Nature of Contents**

*(Text to be added)*

**3.2. Specific Contents**

**3.2.1. Radionuclides**

*(Text to be added)*

**3.2.2. Physical State**

*(Text to be added)*

**3.2.3. Chemical Composition**

*(Text to be added)*

**3.2.4. Quantity**

*(Text to be added)*

**3.2.5. Activity Limit**

*(Text to be added)*

**3.3. Nature of Radiation Emitted**

*(Text to be added)*

**3.4. Materials Present Which Affect the Nature of the Radiation Emitted**

*(Text to be added)*

**3.5. Additional Hazards [507] or problems from Daughter Products**

*(Text to be added)*

**3.6. Surface Heat Flux Limit [565]**

*(Text to be added)*

**3.7. Maximum External Radiation Levels [517, 523. 524 & 526 to 528]**

*(Text to be added)*

**3.7.1. Unshielded Contents Limit [517]**

*(Text to be added)*

**3.7.2. Non-Exclusive Use Limit [527]**

*(Text to be added)*

**3.7.3. Exclusive Use Limit [528.573]**

*(Text to be added)*

**3.7.4. Package TI Limit [526]**

*(Text to be added)*

**3.7.5. Package Surface Limit [527]**

*(Text to be added)*

**4. Specification of Packaging**

**4.1. Design Specification**

This packaging is uniquely specified by the following specification:

*(Add text/state specification reference)*

**4.2. Packaging Makeup**

**4.2.1. Packaging Items**

Component	Description	Drawing No	Design No	Overall Size (mm)	Weight (kg)	Comments
<b>Assembly</b>						
<b>Outer</b>						
<b>Intermediate</b>						
<b>Inner</b>						
<b>Innermost</b>						

**4.2.2. Maximum Contents Mass (net)**

*(Text to be added)*

**4.2.3. Maximum Gross Mass of Package**

*(Text to be added)*

**4.3. Marking and Labelling [530-534, 537-540] (see TCSC 1073)**

**4.3.1. Permanent Marking [533-534]**

*(Text to be added)*

**4.3.2. Provision for Shipment labels [532, 537-540]**

*(Text to be added)*

**5. Transport Operations**

**5.1. Operating and Handling (see TCSC 1079) (reference 6)**

**5.1.1. Operating and Handling [607]**

*(Text to be added)*

**5.1.2. Special Lifting Equipment**

(a) Equipment required

*(Text to be added)*

(b) Maximum and Safe Working Loads

*(Text to be added)*

**5.1.3. Safety of Lifting Attachments [608]**

*(Text to be added)*

**5.1.4. Lifting Features Requiring to be Made Inoperable for Shipment [609]**

*(Text to be added)*

**5.2. Tie-down System (see TCSC 1006) (reference 7)**

**5.2.1. Methods for Securing Packaging**

*(Text to be added)*

**5.2.2. Tie-down Attachments to Withstand Normal Conditions of Transport Without Impairing Ability of Package to Meet the Requirements of Regulations [638]**

*(Text to be added)*

**5.3. Stowage Provisions [562,563, 564, 566]**

*(Text to be added)*

**5.4. Requirements Before Each Shipment**

*(Text to be added)*

**5.5. Action Required During Shipment**

*(Text to be added)*

**5.6. Emergency Instructions [304, 544 (c)]**

*(Text to be added)*

**6. Compliance with Regulatory Requirements****6.1. General Requirements for All Packagings****6.1.1. Design for Ease of Handling and Secure Tie-down [607]**

*(Text to be added)*

**6.1.2. Lifting Attachments – Stressed on Structure [608]**

*(Text to be added)*

**6.1.3. Attachments not Designed to Lift Total Weight of the Package to be Made Inoperable [609]**

*(Text to be added)*

**6.1.4. Design Free from Protruding Features and Facilitate Decontamination [610]**

*(Text to be added)*

**6.1.5. Design to Prevent Collection and Retention of Water [611]**

*(Text to be added)*

**6.1.6. Features Proposed to be Added to the Packaging at the Time of Transport [612]**

*(Text to be added)*

**6.1.7. Design to Withstand Routine Acceleration and Vibration [613]**

*(Text to be added)*

**6.1.8. Materials to be Compatible [614]**

*(Text to be added)*

**6.1.9. Valves to be Protected [615]**

*(Text to be added)*

**6.1.10. Design for Ambient Temperature and Pressures [616]**

*(Text to be added)*

**6.1.11. Designed to Provide Sufficient Shielding to Ensure That Under Routine Conditions of Transport the Radiation Level Does Not Exceed the Prescribed Regulatory Values**

*(Text to be added)*

**6.1.12. Requirements for Radioactive Material Having Other Dangerous Properties [618]**

*(Text to be added)*

**6.2. Additional Requirements for Packages Transported by Air [619-612]**

*(Text to be added)*

**6.2.1. Surface Temperature Limit of 50°C [619]**

*(Text to be added)*

**6.2.2. Containment Under Ambient Temperatures from -40°C to 55°C [620]**

*(Text to be added)*

**6.2.3. Containment Under MNOP (Maximum Normal Operating Pressure) plus 95 kPa [621]**

*(Text to be added)*

**7. Specific Requirements for Each Package type**

Section 7 should contain the applicable boxes from Appendix I depending on the package type.

**8. Quality Assurance**

Evidence should be given that effective and adequate Quality Assurance programmes have been specified and established to cover design, manufacture, testing, documentation, use, maintenance and inspection, for packages, transport and storage in transit.

Evidence should be given also of similar arrangements covering the aspects of transport which are outside the direct control of the applicant. These may be satisfied by reference to national and international QA standards.

It should be shown that the design specification has been implemented and is being achieved (design reviews).

The QA programme shall be consistent with the hazard inherent in the radioactive content.

**8.1. Quality Control in Manufacture and Construction [306]****8.1.1. Tests or Examinations Not Specifically Mentioned in the Quality Assurance Programme on the Constructional Methods and Materials**

(a) Containment System

*(Text to be added)*

(b) Radiation Shielding

*(Text to be added)*

(c) Insulation and Thermal Shielding (Heat Transfer Characteristics)

*(Text to be added)*

**8.2. Checks Before First Shipment**

**8.2.1. Commissioning Trials [501]**

*(Text to be added)*

**8.3. Maintenance**

**8.3.1. Turn-Round Inspection and Maintenance**

*(Text to be added)*

**8.3.2. Periodic Inspection and Maintenance**

*(Text to be added)*

**8.3.3. Performance Tests Before Each Shipment [502(a) ]  
(see also A5.4)**

*(Text to be added)*

**PART 2**

*(Text to be added)*

**List of supporting documents**

Document No	Issue	Title	Comments
Drawings and Component Part Lists			
Specifications			
Test Reports/ Calculation Sheets			
Technical reports			
Operating Instructions			
Maintenance Instructions			
Manufacturing Specifications			
References			

## Appendix B – Specific requirements for each package type

Package Type	Box Numbers to be Completed
IP-1	Box 1
IP-2	Box 1 & 2
IP-2 freight container	Box 1 & 3
IP-2 tanks or tank container	Box 1 & 4
IP-2 IBC	Box 1 & 5
IP-2 UN Packaging	Box 1 & 6
IP-3	Box 1 & 7
Type A solid	Box 1 & 9
Type A liquid/gasses	Box 1, 8 & 9

### Box 1

#### Specific Requirements for Industrial packages IP-1 [623]

*(Text to be added)*

### Box 2 (see TCSC 1096 (reference 10) & 1056 (reference 11))

#### Specific Requirements for Industrial Packages Type IP-2 [624,]

(a) Free drop test [722]

*(Text to be added)*

(b) Stacking test [723]

*(Text to be added)*

a. Actual Mass of packages multiplied by 5

*(Text to be added)*

b. Vertically projected area (in m<sup>2</sup>) multiplied by 13 kPa

*(Text to be added)*

c. Test load: greater of (i) and (ii) above

*(Text to be added)*

(c) Retention of contents [624(a)]

*(Text to be added)*

(d) Shielding integrity [624(b)]

*(Text to be added)*

**Box 3** (see TCSC 1090 (reference 12))**IP-2 freight containers (ISO container) [629]**

- (a) Contents form solid [629(a)]  
*(Text to be added)*
- (b) Compliance with IP-1 requirements [629(b)]  
*(Text to be added)*
- (c) Compliance with ISO standard ISO 1496/1-1990 [629(c)]  
*(Text to be added)*
- (d) Retention of contents [627(c)(i)]  
*(Text to be added)*
- (e) Integrity of shielding of ISO container [627(c) (i)]  
*(Text to be added)*

**Box 4****IP-2 tanks and tank containers [628]**

Compliance with standards prescribed in the Chapter on “Recommendations of Multimodal Tank Transport” of the “United Nations Recommendations on the Transport of Dangerous Goods” [627(b)] or equivalent, and are capable of withstanding a test pressure of 265 kPa; and they are designed so that any additional shielding which is provided shall be capable of withstanding the static and dynamic stresses resulting from handling and routine conditions of transport and of preventing a loss of shielding integrity which would result in more than a 20% increase in the *radiation level* at any external surface of the tank containers.

*(Text to be added)*

**Box 5****Metal IBC containers [630]**

Compliance with standards prescribed in the Chapter on Recommendations on Intermediate Bulk Containers (IBC’s) of the United Nations Recommendations on the Transport of Dangerous Goods [7], for Packing Group I or II, and if they were subjected to the tests prescribed in that document, but with the drop test conducted in the most damaging orientation, they would demonstrate

- (a) Retention of contents [630(c)(i)]

*(Text to be added)*

- (b) Integrity of shielding [630(c)(ii)]

*(Text to be added)*

**Box 6****UN containers [626]**

They are designed to conform to the standards prescribed in the chapter on General Recommendations on Packing of the United Nations Recommendations on the Transport of Dangerous Goods, [626(b)] or other requirements at least equivalent to those standards and when subjected to the tests required for UN Packing Group I or II, they would demonstrate:

- (a) Retention of contents [626(c)(i)]
- (b) Integrity of shielding [626(c)(ii)]

**Box 7** (see TCSC 1096 (reference 10) & 1056(reference 11))**Specific Requirements for Industrial packages Type IP-3 [625]**

- (a) Smallest overall dimension not less than 10 cm [636]

*(Text to be added)*

- (b) Security seal [637]

*(Text to be added)*

- (c) Tie-down attachment to withstand normal and accident conditions of transport without impairing ability of package to meet the requirements of the Regulations [638]

*(Text to be added)*

- (d) Materials to withstand -40°C to +70°C [639]

*(Text to be added)*

- (e) Standard of design, fabrication and manufacturing techniques [640]

*(Text to be added)*

- (f) Positive fastening device for containment system [641]

*(Text to be added)*

- (g) Special form may be considered as part of the containment system [642]

*(Text to be added)*

- (h) Independent positive fastening device for separate containment system [643]

*(Text to be added)*

- (i) Containment system to take into account radiolytic decomposition [644]

*(Text to be added)*

- (j) Effectiveness of containment system under ambient pressure of 60 kPa [645]

*(Text to be added)*

- (k) Enclosure of valves [646]

*(Text to be added)*

- (l) Radiation shields to be secure [647]

*(Text to be added)*

(m) Retention of contents [648(a)]

*(Text to be added)*

(n) Integrity of shielding [648(b)]

*(Text to be added)*

(o) Ullage for liquid contents [649]

*(Text to be added)*

(p) Water spray test [719-721]

*(Text to be added)*

(q) Free drop test [722]

*(Text to be added)*

(r) Stacking test [723]

*(Text to be added)*

a. Actual Mass of packages multiplied by 5

*(Text to be added)*

b. Vertically projected area (in m<sup>2</sup>) multiplied by 13 kPa

*(Text to be added)*

c. Test load: greater of (i) and (ii) above

*(Text to be added)*

(s) Penetration test [724]

*(Text to be added)*

**Box 8** (see TCSC 1096 (reference 10) & 1056 (reference 11))

**Specific Requirements for Type A packages [635]**

(a) Smallest overall dimension not less than 10cm [636]

*(Text to be added)*

(b) Security seal [637]

*(Text to be added)*

(c) Tie-down attachment to withstand normal and accident conditions of transport [638]

*(Text to be added)*

(d) Materials to withstand -40°C to +70°C [639]

*(Text to be added)*

(e) Standard of design, fabrication and manufacturing techniques [640]

*(Text to be added)*

(f) Positive fastening device for containment system [641]

*(Text to be added)*

- (g) Special form material as a component of containment system [642]

*(Text to be added)*

- (h) Independent positive fastening device for separate containment system [643]

*(Text to be added)*

- (i) Containment system to take into account radiolytic decomposition [644]

*(Text to be added)*

- (j) Effectiveness of containment system under ambient pressure of 60 kPa [645]

*(Text to be added)*

- (k) Enclosures of valves [646]

*(Text to be added)*

- (l) Radiation shields to be secure [647]

*(Text to be added)*

- (m) Contents retention and dose rate limitations under normal conditions of transport [648]

- a. To prevent loss or dispersal of contents [648(a)]

*(Text to be added)*

- b. To prevent increase in external radiation levels [648(b)]

*(Text to be added)*

- (n) Water spray test [719-721]

*(Text to be added)*

- (o) Free drop test [722]

*(Text to be added)*

- (p) Stacking test [723]

*(Text to be added)*

- a. Actual Mass of packages multiplied by 5

*(Text to be added)*

- b. Vertically projected area (in m<sup>2</sup>) multiplied by 13 kPa

*(Text to be added)*

- c. Test load: greater of (i) and (ii) above

*(Text to be added)*

- (q) Penetration test [724]

*(Text to be added)*

**Box 9** (see TCSC 1096 (reference 10) & 1056(reference 11))

**Additional requirement for Types A Packages to contain liquids or gases**

(a) Ullage for liquid contents [649]

*(Text to be added)*

(b) Specific design requirements for liquid contents [650, 725]

*(Text to be added)*

(c) Specific design requirements for gaseous contents [651, 725]

*(Text to be added)*

## Appendix C – Format for Certificate of Approval

Approval Identification Mark: GB/xxxxx/TYPE XXX -yy

Issue 1

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# CERTIFICATE OF APPROVAL

## for the Safe Transport of Radioactive Material

Package Type.....

**THE CONTENTS OF THIS DOCUMENT MAY ONLY BE DISCLOSED TO AUTHORISED  
PERSONNEL**

Package Colloquial Name	
PDSR Reference	
Operating Instruction	
Maintenance Instruction	
Supplementary Instructions	
Mode of Transport	
Permissible Gross Mass	
Certificate Validity	

Design Authority	
------------------	--

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Issue 1

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**Change Process**

THE APPROVAL AUTHORITY MUST BE NOTIFIED OF ALL CHANGES BEFORE IMPLEMENTATION

This certificate authorises the use of both the package design and its principal documentation.

Any change to the design of the package or an update to the principal documentation can only be incorporated through either:

Certificate re-issue, or

Receiving a modification form and attaching it to this Certificate of Approval.

**Failure to obtain approval of any changes to the package or its principal documentation will render this Certificate invalid.**

**2. Approval**

This is to certify that the Approval Authority has assessed this packaging and contents as complying with the relevant requirements of the International Atomic Energy Agency Regulations for the Safe Transport of Radioactive Material.

In terms of the permitted radioactive contents, this package complies with the national and international regulations stated in this document.

It is the responsibility of the consignor to ensure that the package conforms fully to the design specification stated and the requirements of each section detailed in this certificate.

For materials with sub-hazards (as defined by the provisions of ADR), chemical compatibility is recommended to be confirmed by the DGSA of the consigning site.

This certificate does not relieve the Consignor from compliance with any requirement of the government of any country through or into which the package will be transported.

On behalf of the Approval Authority

Issued By:                      Signed: .....      Date: .....

Authorised By:                      Signed: .....      Date: .....

**Approval Authority**

*(Name and Address to be added)*

**Packaging**

The packaging is uniquely specified by the following document:

*(Text to be added)*

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	Design No	Drawing No	Title
<b>Assembly</b>	GB/xxxxx	<i>(Text to be added)</i>	<i>(Text to be added)</i>
<b>Outer</b>	<i>(Text to be added)</i>	<i>(Text to be added)</i>	<i>(Text to be added)</i>
<b>Inner</b>	<i>(Text to be added)</i>	<i>(Text to be added)</i>	<i>(Text to be added)</i>

### Identification

Each package shall have the following unique identification mark:

*(Text to be added)*

### Description and Dimensions

*(Text to be added)*

### Package Design Safety Report

The evidence against which the package design has been assessed as complying with the requirements of the IAEA Regulations is contained in:

*(Text to be added)*

### Permitted Contents

*(Text to be added)*

### Restrictions on Content

*(Text to be added)*

### Package Temperature Range (& Pressure range if applicable)

Ambient temperature range for this package design *(Text to be added)*

### Package Radiation Limits

The contents must be restricted such that the following radiation limits are met:

The quantity of material in a single package shall be so restricted that the external radiation level at 3 m from the unshielded material does not exceed 10 mSv/h.

The radiation levels for the **package** shall not exceed 2 mSv/h at any point on the external surface of the package.

### **Exclusive Use**

For **Exclusive Use** the radiation levels shall not exceed 10 mSv/h at any point on the external surface of the package or overpack, and may only exceed 2 mSv/h provided that:

- i) The vehicle is equipped with an enclosure which, during routine conditions of carriage, prevents the access of unauthorised persons to the interior of the enclosure;
- ii) Provisions are made to secure the package or overpack so that its position within the vehicle enclosure remains fixed during routine conditions of carriage, and
- iii) There is no loading or unloading during the shipment.

### **10. Conveyance Radiation Limits**

The radiation levels for the **conveyance** or a **freight container** containing a package or packages shall not exceed:

- a) 2 mSv/h at any point on the external surface of the conveyance.
- b) 0.1 mSv/h at any point 2 m from the external surface of the conveyance.

### **Exclusive Use**

For Exclusive Use the radiation levels for the conveyance or a freight container containing a package or packages shall not exceed:

- a) mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces.
- b) mSv/h at any point 2 m from the vertical planes represented by the other lateral surfaces of the conveyance.

### **11. Transport Index Limits**

Multiplication factors must be applied, where applicable, as defined in Table VI of SSR-6.

Any package having a TI greater than 10 shall be transported only under 'Exclusive Use'.

### **12. Exclusive Use Shipments**

Under **Exclusive Use** the transport documents shall include the statement "EXCLUSIVE USE SHIPMENT".

### **13. Quality Assurance**

The packaging has been designed and approved in accordance with

*(Text to be added)*

As required by IAEA SSR-6 [306] the use, maintenance, inspection, transport and in-transit storage shall be carried out under a Quality Assurance programme to ensure compliance with the requirements of this Certificate of Approval, and the National and International regulations.

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#### **14. Contamination**

Non-fixed contamination on the external surfaces of the packages; and on the internal and external surfaces of freight containers, overpacks or vehicles used for transporting packages shall be kept as low as practicable and shall not exceed the limits specified below:

- a) Beta emitters, gamma emitters and low toxicity alpha emitters - 4 Bq/cm<sup>2</sup>
- b) Alpha emitters other than those of low toxicity - 0.4 Bq/cm<sup>2</sup>

#### **15. Labelling and Placards**

Labelling and marking of packages and the placarding of vehicles shall be in accordance with the regulations listed in Section 18 of this approval certificate.

#### **16. Storage and Dispatch**

- a) Segregation during storage is required from other dangerous goods, and from persons and undeveloped photographic films and plates.
- b) Provided that the average surface heat flux does not exceed 15 W/m<sup>2</sup> and that the immediately surrounding cargo is not in sacks or bags, a package may be carried or stored among packaged general cargo without any special stowage provisions.

#### **17. Emergency Response**

*(Text to be added)*

#### **18. Regulations and Codes of Practice Governing the Transport of Radioactive Material**

*It is the Applicant's responsibility to check and confirm that the appropriate Regulation, governing the Transport of Radioactive Material is correct and up to date at the time of issue.*

*The following Regulations are currently applicable.*

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<b>Mode of Transport</b>	<b>United Kingdom Regulations</b>
<b>General</b>	The Health and Safety at Work Act 1974. The Ionising Radiations Regulations 1999(SI1999/3232). The Radioactive Material (Road Transport) Act 1991.
<b>Road &amp; Rail</b>	The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009, Statutory Instrument 2009 No. 1348.  As Amended 2011 Statutory Instrument 2011 No. 1885.
<b>Seaports and UK Territorial Waters</b>	Dangerous Goods in Harbour Areas Regulations 2016/721
<b>Storage in Transit</b>	Radioactive Substances Act 1993 Radioactive Substances (Storage in Transit) Exemption Order, 1962 SI 2646 and 2785
<b>Air</b>	The Air Navigation Order 2009, SI 2009 No. 3015. The Air Navigation (Dangerous Goods) Regulations 2002, SI 2002 No. 2786. The Air Navigation (Dangerous Goods) (Amendment) (No.2) Regulations 2011 SI 2011 No. 1454.

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Mode of Transport	International Regulations
<b>General</b>	IAEA; SSR 6 Regulations for the Safe Transport of Radioactive Material, 2012 Edition. UNECE Transport of Dangerous Goods (Orange Book) – and Classification and Labelling of Chemicals (Purple Book) UN Model Regulations 2015 19 <sup>th</sup> Revised Edition. UN Manual of Tests and Criteria (Rev 6)
<b>Road</b>	United Nations Economic Commission for Europe (UNECE) European agreement concerning the International Carriage of Dangerous Goods by Road (ADR) 2017 edition.
<b>Rail</b>	Intergovernmental Organisation for International Carriage by Rail (OTIF).  Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) 2017 Edition.
<b>Sea</b>	International Maritime Organisation Dangerous Goods (IMDG) 2014 Edition including Amendment 37-14. (valid until; December 2018) International Maritime Dangerous Goods (IMDG) 2016 Edition including Amendment 38-16. (optional from 1 January/2017 mandatory; 1/January 2018)
<b>Air</b>	International Civil Aviation Organisation (ICAO), Technical Instructions for the Safe Transport of Dangerous Goods by Air, 2017 - 2018 Edition IATA, International Air Transport Association (IATA), IATA Dangerous Goods Regulations 2013 58 <sup>th</sup> Edition (Valid until 31 December 2017)

Note:

Notwithstanding the existence of international regulations, it is still necessary to take account of national and local regulations which may impose additional restrictions.

The United Kingdom regulations do not in all cases extend to Northern Ireland.

Further Guidance may be obtained from RAMTUC Transport Regulations List

### 19. Package Illustration

*(include illustration, diagram ,picture or photograph to allow easy identification of package. Consideration to be given to inclusion of package identification marking/plate)*

### 20. Packaging, dimensions and weight

Packaging description: *(Text to be added)*

Mass of packaging (package without contents): *(Text to be added)*

Maximum gross weight of package: *(Text to be added)*

## Appendix D– Example of an Application Form for Approval of Minor Modification to a Transport Package Design

### MODIFICATION TO TRANSPORT PACKAGE DESIGN

Design No.	Package Title:	Reference No:
Expiry date of current certificate:		
Applicant		
Name	Address	Telephone No.
Signature:		Date of Application:
Proposed modification:		
Justification (Preservation of original design intent):		
Identification of parts of original application affected:		
Statement by Responsible Officer:		
Responsible Officer: Signature		Date:

**NOTE:** If space allowed is insufficient attach additional sheets

**EXAMPLE OF ADDITIONAL SHEET  
MODIFICATION TO TRANSPORT PACKAGE DESIGN**

Design No.	Package Title:	Reference No:

## Appendix E – New Packaging Design Activity Schedule

Below is an idealised top-level activity list and matrix for implementing new design. It is accepted that different organisations may use different terminology and have developed their own in-house procedures.

Furthermore, the breadth and depth of the work required will vary according to the complexity or level of technical difficulty presented by the requirement.

For example, a development of an existing proven design is likely to rely on data and experience generated from the original design. As a consequence, less review and testing may be needed.

The work is likely to be done under the aegis of an accredited QA System and it is assumed that QA Plans for design and manufacture defining hold points for reviews and checking/ verification will be put in place by the PDT.

The matrix does not make any attempt to incorporate commercial activities such as cost benefit analyses, best available technology studies that organisations may have to prepare. It should be taken as the minimum required to successfully put a new packaging into service. Some activities may be run concurrently.

The one aspect that cannot be emphasised enough is early involvement of all stakeholders and the Approval Authority. The latter should retain independence from the design team but at the same time it can be valuable to have early opinions or reservations from the Approval Authority to avoid nugatory work.

Activity	Package Design Team (PDT)	RAM Expert Physicists / Chemists	DGS A	Operator/ Maintainer / Haulier	Approval Authority	Remarks
<b>New requirement for packaging identified</b>						Can arise if e.g. different materials need shipping or existing packages are obsolescent
<b>Verify confirm nature of RAM</b>	Input	Lead	Input		Oversight	Radiological/ chemical/ physical properties
<b>Package design team to identify package category</b>	Lead	Input	Input		Oversight	Excepted through to Type A
<b>Packaging outline specification produced</b>	Lead	Input	Input	Input	Oversight	
<b>PDT determines if suitable packaging</b>	Lead					If existing packaging can be used, then it may only

already exists						require review of supplier's credentials and relevant documentation . A pre-use packing, and handling trial may be beneficial.
Prepare concept design	Lead					To include, option/ BAT study (if justified) and design outline calculations
Review concept design	Lead	Input	Input	Input	Oversight	
Resolve design review reservations with stakeholders	Lead					
Finalise concept design	Lead					At this stage all design calculations should be completed
Prepare detail drawings	Lead					
Prepare draft PDSR	Lead	Input	Input		Oversight	This will in effect be final design review
Prepare test specification	Lead					
Review test specification and draft PDSR	Lead	Input	Input		Oversight	
Manufacture prototype for testing and or operational trials	Lead					PDT may lead this at minimum they will have input dealing with manufacturing queries. Project manager may be appointed if not covered by PDT
Test	Lead			Input	Oversight	To include operational

						trials
<b>Test report</b>	Lead					
<b>Finish PDSR and prepare CoA and final check</b>	Lead					
<b>Review PDSR and supporting documents</b>	Lead	Input	Input	Input	Oversight	
<b>Resolve any remaining review reservations with stakeholders</b>	Lead					
<b>Sign CoA put into service</b>	Input				Lead	
<b>Monitor</b>	Lead			Input		This may be useful for complex designs.