Geological Disposal:
Management System Requirements for Waste Packaging

June 2017
Geological Disposal:
Management System Requirements for Waste Packaging

June 2017
Conditions of Publication
This report is made available under the Radioactive Waste Management Limited (RWM) Transparency Policy. In line with this policy, RWM is seeking to make information on its activities readily available, and to enable interested parties to have access to and influence on its future programmes. The report may be freely used for non-commercial purposes. RWM is a wholly owned subsidiary of the Nuclear Decommissioning Authority (NDA), accordingly all commercial uses, including copying and re-publication, require permission from the NDA. All copyright, database rights and other intellectual property rights reside with the NDA.

Applications for permission to use the report commercially should be made to the NDA Information Manager.

Although great care has been taken to ensure the accuracy and completeness of the information contained in this publication, the NDA cannot assume any responsibility for consequences that may arise from its use by other parties.

© Nuclear Decommissioning Authority 2017. All rights reserved.

Bibliography
If you would like to see other reports available from RWM and the NDA, a complete listing can be viewed at our website www.nda.gov.uk, or please write to us at the address below.

Feedback
Readers are invited to provide feedback on this report and on the means of improving the range of reports published. Feedback should be addressed to:

Head of Stakeholder Engagement and Communications
Radioactive Waste Management Limited
Building 587
Curie Avenue
Harwell Oxford
Didcot
OX11 0RH

email  rwmfeedback@nda.gov.uk
Executive Summary

This document forms part of the *Waste Package Specification and Guidance Documentation (WPSGD)*, a suite of documents prepared and issued by Radioactive Waste Management Ltd (RWM). The WPSGD is intended to provide a 'user-level' interpretation of the RWM packaging specifications, and other aspects of geological disposal, to assist UK waste packagers in the development of plans for the packaging of higher activity waste in a manner suitable for geological disposal.

Key documents in the WPSGD are the *Waste Package Specifications (WPS)* which define the requirements for the transport and geological disposal of waste packages manufactured using standardised designs of waste container. The WPS are based on the high level requirements for all waste packages as defined by the generic *Disposal System Specification (DSS)* and are derived from the bounding requirements for waste packages containing a specific category of waste, as defined by the relevant *Generic Specification*.

This document provides a specification for the management system arrangements that waste packagers should establish and maintain during development of the packaging process, packaging of the waste and storage of the resulting waste packages.

The WPSGD is subject to periodic enhancement and revision. Users are therefore advised to refer to the RWM website to confirm that they are in possession of the latest version of any documentation used.

<table>
<thead>
<tr>
<th>WPSGD DOCUMENT NUMBER WPS/420 - VERSION HISTORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERSION</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>WPS/420/01</td>
</tr>
</tbody>
</table>
List of Contents

1 Introduction .......................... 1
2 Aims and principles ............... 2
3 Management system arrangements for waste packaging 2
   3.1 Design and development ...... 3
   3.2 Processing ..................... 3
   3.3 Interim storage ............... 3
   3.4 Continual requirements ...... 3
4 Quality plans ....................... 4
5 Waste Product Specification ..... 4
6 Criticality Compliance Assurance Document 4
7 Waste package disposability records and the Package Record Specification 5
8 Management of non-conforming waste packages 5
9 Demonstration of effectiveness and verification 5
10 References ......................... 6
## Abbreviations and acronyms used in this document

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCAD</td>
<td>Criticality Compliance Assurance Document</td>
</tr>
<tr>
<td>DSS</td>
<td>Disposal System Specification</td>
</tr>
<tr>
<td>GDF</td>
<td>geological disposal facility</td>
</tr>
<tr>
<td>NDA</td>
<td>Nuclear Decommissioning Authority</td>
</tr>
<tr>
<td>PRS</td>
<td>Package Record Specification</td>
</tr>
<tr>
<td>RWM</td>
<td>Radioactive Waste Management Ltd</td>
</tr>
<tr>
<td>WPS</td>
<td>Waste Package Specification</td>
</tr>
<tr>
<td>WPrS</td>
<td>Waste Product Specification</td>
</tr>
<tr>
<td>WPSGD</td>
<td>Waste Package Specification and Guidance Documentation</td>
</tr>
</tbody>
</table>
1 Introduction

The Nuclear Decommissioning Authority (NDA) has established Radioactive Waste Management Ltd (RWM) as the body responsible for implementing UK Government policy for the long-term management of higher activity radioactive wastes, as set out in the Implementing Geological Disposal White Paper [1]. The White Paper outlines a framework for managing higher activity radioactive wastes in the long-term through geological disposal, which will be implemented alongside the ongoing interim storage of waste packages and supporting research.

RWM produces packaging specifications as a means of providing a baseline against which the suitability of plans to package higher activity waste for geological disposal can be assessed. In this way, RWM assists the holders of radioactive waste in the development and implementation of such plans, by defining the requirements for waste packages which would be compatible with the anticipated needs for transport to, and disposal in, a geological disposal facility (GDF).

The packaging specifications form a hierarchy which comprises three levels:

- The Disposal System Specification (DSS) [2]; which defines the requirements for all waste packages which are destined for geological disposal
- Generic Specifications; which apply the high-level packaging requirements defined by the DSS to waste packages containing a specific type of waste, and
- Waste Package Specifications (WPS); which apply the general requirements defined by a Generic Specification to waste packages manufactured using standardised designs of waste container.

As a means of making the full range of RWM packaging specifications available to waste producers and other stakeholders, a suite of documentation known as the Waste Package Specification and Guidance Documentation (WPSGD) is published and maintained for ready access via the RWM website.

The WPSGD includes a range of WPS for different waste package types together with explanatory material and guidance that users will find helpful when it comes to application of the WPS to practical packaging projects. For further information on the extent and the role of the WPSGD, reference should be made to the Introduction to the RWM Waste Package Specification and Guidance Documentation [3].

The scope of this document is not intended to specify how waste packagers should design their management system(s) to meet Customer and applicable statutory and regulatory requirements. Appropriate management system arrangements are an intrinsic part of an effective waste management process. They provide a disciplined approach which ensures that arrangements are in place covering all quality and safety related aspects throughout the lifecycle of a waste package. This document summarises the requirements of RWM for an effective management system(s) that will deliver waste packages consistent with geological disposal.
2 Aims and principles

Waste packages are required to be manufactured under a formal and effective management system with the objective of assuring the properties and performance of the waste package and the sufficiency of the associated waste package records. A sub-set of the management system documents shall be kept as a component of those records to demonstrate that all operations relating to product quality were adequately controlled. Hence, an effective management system not only ensures that suitable arrangements and procedures are in place during waste packaging, but also gives confidence in the future as to the quality of the waste packages and their associated waste package disposability records.

It is the aim of this requirements document to enable waste packagers to plan and design the relevant components of their own management system arrangements, which will provide assurance that appropriate procedures are in place and will be followed during all stages of waste management.

It is important to develop the management system arrangements which control the properties, performance and quality of waste packages through consultation with RWM. This should normally form part of the Disposability Assessment process for assessing waste packaging proposals.

RWM recognises that the management system(s) adopted by waste packagers will be required to address requirements other than those relating to geological disposal. This document does not consider these elements of such systems.

3 Management system arrangements for waste packaging

Within the overall management system, processes shall be established and implemented for the packaging of radioactive wastes, which encompass the whole lifecycle of a waste package, to ensure that packaged waste has the properties ascribed to it. These management system arrangements should apply to all activities, interactions and aspects that can affect the properties and performance of the waste package. It is recognised that established systems are likely to comply with ISO 9001 [4] or equivalent.

Appropriate management system arrangements should be applied during each stage of the waste packaging process, as part of an overall integrated strategy. The three key stages in the waste packaging process are:

- design and development
- processing
- interim storage

The arrangements should be reviewed periodically and adequate records maintained. Persons and organisations responsible for verifying correct performance should have appropriate authority and independence.

---

1 The waste package is defined as the waste container and its waste along with the records that demonstrate what it is and why it is disposable in a GDF.
3.1 Design and development

During the design and development stage, there should be appropriate management system arrangements in place to control:

- waste characterisation and inventory derivation
- container design
- wasteform development
- process development
- plant specification and design
- submissions for disposability assessments
- addressing Action Points and findings

3.2 Processing

During the processing stage, there should be appropriate management system arrangements in place to control:

- waste retrieval and loading
- container manufacture
- plant commissioning
- plant operations
- raw materials storage
- management of non-conforming waste packages

3.3 Interim storage

During the interim storage stage, there should be appropriate management system arrangements in place to control:

- conditions in the store
- monitoring of waste packages and storage conditions
- inspections of the store and waste packages
- asset management

3.4 Continual requirements

During all stages of waste management, there should be appropriate management system arrangements in place to control:

- change control and continual improvement of waste package design, processing plant and interim storage
- production of waste package disposability records at all stages
- long-term retention of waste package disposability records
- risk management
It is important to recognise that the management of waste packages subsequent to manufacture should also be controlled under a suitable management system. In addition to the ongoing management of the packages themselves, it is essential that the waste package disposability records are managed and maintained appropriately. This expectation is to be distinguished from the requirement to identify the necessary contents of waste package disposability records.

There are several key documents which shall be included as part of an effective management system; these are described in the following sections.

4 Quality plans

As part of the management system arrangements, the waste packager is required to develop basic controlling documents, typically denoted quality plans, for all stages of the process. Quality plans, or equivalent, shall provide reference to the controlling specifications (Waste Product Specification, Criticality Compliance Assurance Document, specifications for interim storage, etc.) and any project-specific work instructions required during design and development, processing and interim storage. During the processing and interim storage stages, the quality plan shall define the process control measures that will be in place and identifies the tests, measurements or inspections that will be undertaken and what acceptance criteria will be applied.

5 Waste Product Specification

The waste packager shall establish and maintain a *Waste Product Specification* (WPrS) [5] for the waste package. A WPrS shall define, as far as necessary, the waste envelope, waste container, conditioning materials, wasteform formulation, process conditions, storage conditions and all relevant supporting R&D (including product properties and performance) for each waste package type.

The WPrS is an important component of the waste package disposability record that will follow a waste package through all subsequent stages of waste management and that will be used to assess the suitability of the waste package for acceptance into each stage.

Guidance on the preparation of a WPrS is provided in *Guidance on the Structure and Format of Waste Product Specifications* [5].

6 Criticality Compliance Assurance Document

The waste packager shall establish and maintain a *Criticality Compliance Assurance Document* (CCAD) [6]. The CCAD shall demonstrate the adequacy of the waste packagers’ arrangements for ensuring the criticality safety of waste packages during all stages of their long-term management. As such, the CCAD should be seen as providing a guide to the controls incorporated within a packaging process to avoid the packaging of excessive fissile material or other materials that could enhance unacceptably the possibility of a criticality occurring (for example, neutron moderators and/or reflectors). Typically, it focuses on waste packaging operations, package inventory determination or other means of managing the fissile material content, and process faults.

Guidance on the preparation of a CCAD is provided in *Guidance on the Preparation of Criticality Compliance Assurance Documentation for Waste Packaging Proposals* [6].
7 Waste package disposability records and the Package Record Specification

Each packaging process should include a tailored system for acquiring, recording and managing the data and information that would constitute the waste package disposability record, ensuring it is appropriate and proportionate for the packages to be produced. The system needs to cover the history of the packaged waste from the time of arising, through initial waste characterisation, waste package development, to package production, storage, transport and emplacement in a GDF.

The waste packager shall establish and maintain a Package Record Specification (PRS) as part of the Waste Package Data and Information Recording Requirements [7]. The PRS provides a concise statement of the overarching data and information recording system, and defines the documents containing the data and information that are required for a compliant waste package disposability record.

Guidance on these requirements is provided in Waste Package Data and Information Recording Requirements: Explanatory Material and Guidance [8].

8 Management of non-conforming waste packages

Onward management of waste packages would potentially include the management of non-conforming waste packages, and therefore management system arrangements should be in place for the sentencing of any such packages. The arrangements should cover the review of non-conforming waste packages to determine their final status and any necessary actions.

Guidance on the sentencing of non-conforming waste packages is provided in Guidance on the Sentencing of Non-compliant Waste Packages [9].

9 Demonstration of effectiveness and verification

The waste packager shall demonstrate to RWM, by providing objective evidence, that:

- the management system(s) employed apply to all stages of the lifecycle from initial design through to final packaging and interim storage
- the waste is being packaged in compliance with the management system(s), WPrS and CCAD
- the implementation of the management system(s) and compliance with the WPrS and CCAD are verified by independent audit or assessment

In some cases, evidence of robust management system arrangements may be used to provide sufficient evidence of compliance with the waste package requirements, thus reducing the amount of information required at the package level. Where this approach is proposed by the waste packager, it shall be agreed with RWM through the Disposability Assessment process.

It should be noted that waste packager organisations are subject to organisational changes. Where this is the case, there should be a ‘handshake arrangement’ between the relevant parties to ensure that:

- appropriate management systems will continue to be maintained for the duration of the project
• product quality issues will continue to be addressed at each stage of the packaging lifecycle

The waste packager shall provide, upon reasonable request, access for RWM (or its agreed agents) to conduct assessment(s) of activities that affect the quality of waste packages.

10 References


4 BSI, Quality Management Systems – Requirements, BS EN ISO 9001.


