Geological Disposal:
Waste Package Data and Information Recording Requirements
November 2015
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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 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 Waste Package Specification 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 defines the waste package data and information recording requirements to cover the history of the packaged waste from the time of waste arising, through initial waste characterisation, waste package development, to package production, storage, transport and emplacement in a GDF.

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.
1 Introduction

The Nuclear Decommissioning Authority (NDA), through Radioactive Waste Management Ltd (RWM), is 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 waste 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 Generic Waste Package Specification (GWPS) [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 GWPS 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.

The WPS, together with a wide range of explanatory material and guidance to aid users in the development of proposals to package waste, make up a suite of documentation known as the Waste Package Specification and Guidance Documentation (WPSGD). For further information on the extent and the role of the WPSGD, all of which can be accessed via the RWM website, reference should be made to the Introduction to the RWM Waste Package Specification and Guidance Documentation [3].

In order that every waste package can be assessed against the requirements for safe and cost-effective handling, storage, transport and eventual disposal, RWM requires that waste packagers use all reasonable endeavours to acquire and record sufficient data and information for waste packages into a disposability record. In particular, this information would be used to demonstrate conformance with future acceptance criteria for the anticipated transport system and a GDF. This document provides a concise statement of those data and information recording requirements and is supported by associated guidance [4] and justification [5]. The former provides interpretation of the requirements and commentary on practical approaches to their implementation, so that they may be satisfied in an optimal way. The latter explains the derivation of the requirements and provides links to the key drivers through consideration of current UK legislation, associated guidance and international guidance relating to the transport and disposal of ILW.

It is recognised that existing waste package data and information recording systems have been produced against the previous specification. The current version of the Waste Package Data and Information Recording Requirements (this document) represents a significant evolution of previous versions. Nevertheless, previously endorsed proposals would be expected to remain valid.
2 Aims and principles

Information obtained during waste package development and manufacture will need to be made available by the waste packager to support all future stages of the long-term management of waste packages. Additional information must continue to be generated throughout the various stages of waste management, but the reliability of the information at any moment rests upon the quality and integrity of all earlier information. The process must therefore begin with the design and production of each individual waste package.

It is therefore the aim of this document to enable waste packagers to design their own data and information recording system to allow demonstration of compliance of waste packages with relevant legislation and regulatory guidance, and conformance against any other relevant specifications, at all stages of waste package management.

The overall aims of the data and information recording requirements are to facilitate provision of a disposability record, which:

   a) can be used to demonstrate conformance with the relevant Waste Product Specification (WPrS) and Criticality Compliance Assurance Documentation (CCAD) against which it was produced

   b) enables demonstration of compliance with any requirements arising from the IAEA Transport Regulations (as implemented in UK legislation)

   c) enables future demonstration of conformance with the acceptance criteria for a GDF, currently embodied in the WPSGD

   d) supports future demonstration of compliance with any requirements arising from regulatory permissions that underpin the strategy for, and implementation of, geological disposal

   e) encompasses data that:

      - supports the recorded physical, chemical and radionuclide content of each waste package
      - identifies, or permits prediction of, waste package properties and performance
      - allows prediction of the evolution of the waste package characteristics with time, and of the effect of interactions with other waste packages and the various components of a GDF.

What needs to be recorded, therefore, are appropriate data and information that can be used as a basis to establish, infer or predict waste package properties and performance under the range of circumstances that will pertain during the various stages of their long-term management. The waste package disposability record should be standalone and intelligible at any point in the lifecycle of the waste package.

3 Implementation

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 waste arising, through initial waste characterisation, waste package development, to package production, storage, transport and emplacement in a GDF. This document provides a framework for the development of a waste package disposability record specification (DRS), but strict adherence to the structure presented herein is not necessary to develop a successful system.
It is important to develop the required system through consultation with RWM. This should normally form part of the Disposability Assessment process for assessing waste packaging proposals [6], addressing the requirements for all stages of long-term management. In this way, each waste package data and information recording system can be optimised through provision of advice by RWM on aspects such as the key requirements, the accuracy required for quantitative data and identification of those data and information that are required to demonstrate compliance. Furthermore, the submission documentation compiled for a packaging proposal can itself be used as a valuable source of underpinning information and justification for the waste packages.

The implementation of such a system should include an overarching strategy, which may be applicable to multiple waste packaging projects. This should ensure that all data and information required are captured efficiently, to avoid unnecessary duplication of records.

4 Structure of the waste package data and information recording requirements

A hierarchical structure has been adopted for the Waste Package Data and Information Recording Requirements, based on classes, categories and fields. This structure is intended to present a logical progression from the general to the specific.

Three classes of data and information are recognised, as follows:

- Class A – underpinning and justification
- Class B – specification
- Class C – compliance.

The classes largely correspond to different scales of recording. Class A documents would generally be expected to provide information for a broad group of waste packages, potentially from a number of similar waste streams. The data and information in Class B would usually encompass waste packages produced from a single waste stream. Class C documents are expected to be unique to each waste package, each being marked with the relevant unique identifier. It is recognised, however, that some records, regardless of Class, may be relevant to a sub-set of waste packages; production and management of these records should be considered carefully in the design of the recording system to avoid unnecessary duplication. The structure of a waste package disposability record is illustrated in Figure 1.

Within each class, a number of categories are identified to direct the waste packager to the essential components of a waste package disposability record. These categories may be further divided into fields, which provide the level of detail required to plan and produce waste package data and information recording system, and which should be the level at which primary information is collected and retained.

5 Class A – underpinning and justification

This Class encompasses information relating to the waste stream as a whole, including the completed waste packages. The principal purpose of this class is to record the basis for, and justification of, the specification documents (Class B). Such records will, in practice, demonstrate why compliant waste packages would be acceptable for transport and disposal.

The following categories of data and information are recognised within this class:

- Background, nature and origin of the waste
- Waste package development
- Container development
- Data and information recording system
- Storage, monitoring and inspection
- Management system arrangements, including Quality Plan.

Further details of the categories and fields that comprise Class A are provided in Table 1.

6 Class B – specification

This Class consists of relevant specification documents, forming a key part of the waste package disposability record. Potentially these documents could be seen as part of Class A, but for clarity a separate class has been adopted. Note that in some cases, there could be more than one version of a specification document for a particular group of waste packages; all relevant versions would be required as part of the disposability record. Specification documents include:

- DRS
- WPrS
- CCAD
- Transport package design safety documentation.

Further details of the categories and fields that comprise Class B are provided in Table 2.

7 Class C – compliance

This Class encompasses data and information collected at the package-scale for the purpose of demonstrating compliance with all recognised specification documents.

This Class is intended to align with the understanding that the purpose of collecting data and information at the package-scale is to demonstrate compliance (or conformance) with a requirement (which would be embodied as a specification document). The following categories of data and information are recognised:

- Waste package identifier
- Specification and compliance
- Container compliance
- Waste compliance
- Processing compliance
- Waste package compliance
- Waste package management compliance
- Resolution of non-compliance (when relevant)
- Other package-scale information.

Further details of the categories and fields that comprise Class C are provided in Table 3. Waste packagers should note that there are fields that may not be relevant to their waste packages.
## References


Figure 1  Schematic basis for waste package disposability record

Letter of Compliance Submission and RWM Assessment

A - Underpinning and Justification
A1 Background, nature and origin of the waste
A2 Waste package development
A3 Container development
A4 Data and information recording system
A5 Storage, monitoring and inspection
A6 Management system arrangements, including Quality Plan

B - Specification
B1 Disposability Record Specification
B2 Waste Product Specification
B3 Criticality Compliance Assurance Documentation
B4 Transport package design

C - Compliance
C1 Waste package identifier
C2 Specification and compliance
C3 Container compliance
C4 Waste compliance
C5 Processing compliance
C6 Waste package compliance
C7 Waste package management
C8 Resolution of non-compliance
C9 Other package-scale records

Packaging Operations
Table 1  Class A (Underpinning and Justification)

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<th>Comments</th>
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<td>Description of nature and origin of the raw waste</td>
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<td>A1.2</td>
<td>UK RWI identifier(s) and issue of the RWI</td>
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<td>A1.3</td>
<td>General background information</td>
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<tr>
<td>A2</td>
<td>A2.1</td>
<td>Process development (including limits and exclusions)</td>
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<td>A2.2</td>
<td>Small and/or full-scale testing</td>
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<td>A2.3</td>
<td>Demonstration of anticipated waste package properties</td>
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<td>A2.4</td>
<td>Evidence of plant commissioning</td>
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<td>Package-specific Criticality Safety Assessment(s) (CSA)</td>
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<td>Container development</td>
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<td>Derivation of waste composition, including compositional fingerprints</td>
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<td>Derivation of radionuclide inventory, including fingerprints</td>
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<td>Justification for storage, monitoring and inspection arrangements</td>
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Table 2  Class B (Specification)

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<td>Contents specification and underpinning analysis for Type B transport package</td>
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<td>Class C (Compliance)</td>
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<td>Specification and compliance</td>
<td>C2.1 WPrS</td>
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<td>C2.2 CCAD</td>
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<td>C2.3 DRS</td>
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<td>C2.4 Transport package design safety documentation</td>
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<td>C2.5 Statement of compliance with relevant specifications</td>
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<td>C3</td>
<td>Container compliance</td>
<td>C3.1 Evidence of compliance with container design and specification</td>
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<td>C3.2 Acceptance of container for use</td>
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<td>C4.3 Evidence of compliance with Safe Fissile Mass</td>
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<td>C4.4 Evidence of compliance with compositional limits for the waste, including demonstration of acceptability of the waste</td>
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<td>C4.5 Record of exclusions</td>
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<td>C4.6 Evidence that hazardous materials are managed appropriately</td>
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<td>C4.7 Analysis errors and uncertainties</td>
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<td>C5.3 Evidence of fulfillment of process requirements</td>
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<td>C5.4 Confirmatory testing</td>
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<td>C6.5 Specific activity at time of transport</td>
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<td>C7.2 Store arrangements (store name, location, cross-reference to surrogate packages for inspection etc)</td>
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