Geological Disposal:
Requirements for Waste Package Identification System

September 2016
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WASTE PACKAGE SPECIFICATION AND GUIDANCE DOCUMENTATION
REQUIREMENTS FOR WASTE PACKAGE IDENTIFICATION SYSTEM

This document forms part of the Waste Package Specification and Guidance Documentation (WPSGD), a suite of documents prepared and issued by 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 Waste Package Specification (GWPS) 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 format and structure of waste package identifiers, their allocation by RWM and their use by waste packagers.

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.

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<td>Aligns with GWPS (Nirex Report N/104) as published June 2005</td>
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<td>WPS/410/03</td>
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<td>Specification updated to acknowledge creation of RWM, the need for contrast/relief of identifiers included. Aligns with Generic Specification for waste packages containing low heat generating waste (NDA Report no. NDA/RWMD/068), as published August 2012.</td>
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### Abbreviations and acronyms used in this document

<table>
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<th>Acronym</th>
<th>Description</th>
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<td>geological disposal facility</td>
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<td>GWPS</td>
<td>Generic Waste Package Specification</td>
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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 management of higher activity radioactive wastes, as set out in the 2014 Implementing Geological Disposal White Paper [1]. The White Paper outlines a framework for managing those 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 those responsible for the management 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 packaging specifications, together with a wide range of explanatory material and guidance that users should find helpful 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].

Every waste package destined for long-term management must be allocated a unique identifier which will be used to:

- allow the waste package to be identified during all the relevant stages of long-term management, up to and including emplacement in a GDF;
- enable a record of the location of the waste package to be maintained throughout that long-term management; and
- provide an unambiguous and permanent link between the waste package and the Waste Package Disposability Record created and maintained during its manufacture and interim storage.

This Specification defines the format and structure of the waste package identifier, the manner of its marking on waste packages, the allocation of identifiers by RWM, and their use by waste packagers. It is supported by guidance, which contains details of the basis of the identification requirements, together with an example of the method used to confirm the validity of an identifier [4].
2 Identifier system and format

2.1 The identifier system
Waste packages shall remain identifiable for a minimum period of 150 years.

2.2 The format of the identifier
The format of the RWM identifier shall be ten alpha-numeric characters arranged in a horizontal sequence from left to right with no intermediate spaces or other markings, as shown in Figure 1.

Figure 1 Format of waste package identifier

![Diagram of waste package identifier with data fields]

The characters shall be of the Optical Character Recognition A form (OCR-A), as specified by BS 5464: Part 1 [5] (Figure 2). The alphabetic characters shall be restricted to those used in the hexadecimal numbering system, i.e. A, B, C, D, E, F.

Figure 2 Acceptable OCR-A characters

![Diagram of acceptable OCR-A characters]

2.3 Identifier data fields
The identifier shall comprise three data fields which are contained within a ten alpha-numeric character sequence.

The three data fields shall be identified as Data Field 1, Data Field 2 and Data Field 3 and shall be specified as follows:
2.3.1 Data Field 1
Data Field 1 identifies the original source of the waste package (i.e. the packaging site or plant).

Data Field 1 shall consist of two sequential hexadecimal characters (HH) each of which shall be one of the following:

0 1 2 3 4 5 6 7 8 9 A B C D E F

2.3.2 Data Field 2
Data Field 2 identifies the package number from a particular waste packaging site or plant.

Data Field 2 shall consist of six sequential decimal characters (DDDDDD) each of which shall be one of the following:

0 1 2 3 4 5 6 7 8 9

2.3.3 Data Field 3
Data Field 3 is a check number which is derived mathematically from Data Field 1 and Data Field 2.

Data Field 3 shall consist of a two sequential decimal characters (CC) each of which shall be one of the following:

0 1 2 3 4 5 6 7 8 9

2.4 Check number system
The check number for an identifier shall be derived by the following algorithm:

\[ CC = 97 - R \]

Where HHDDDDDD is a real number and ‘mod’ represents the modulo function \( n \mod m \) which gives the remainder when \( n \) is divided by \( m \).

The check number shall always consist of two digits and shall be prefaced by zero if the result of applying the algorithm given above is less than ten.

Each value of H is to be converted to its decimal equivalent and is to consist of two digits using zeros, where necessary, to result in a four digit decimal equivalent for Data Field 1.

When a computer program is used to generate check numbers, the waste packager shall ensure that this is carried out using suitably validated software.

3 Marking of identifiers on waste packages
Every waste package that is to be sent to the GDF shall be marked with its unique identifier of the format, size, and at multiple locations, as specified in the appropriate WPS for that waste package.

The identifier shall be applied to a waste package in such a manner that it enables unique identification of the waste package until the end of the GDF operational period. The identifier shall remain machine readable for a minimum period of 150 years following manufacture\(^1\).

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\( ^1 \) The requirement for readability is also related to the operational phase of the GDF during which there may be a need to handle or recover waste packages from the disposal areas of the
Identifiers are expected to be marked on a metal surface and shall display adequate contrast with the natural reflectivity of the metal substrate, such as to facilitate effective machine reading when viewed under artificial light.

4 Allocation of waste package identifiers

4.1 Allocation of Data Field 1 identifiers

RWM shall allocate Data Field 1 identifiers to waste packagers on request and shall maintain the definitive record of Data Field 1 identifier allocation (see Appendix A).

4.2 Allocation of Data Field 2 identifiers

The waste packager shall allocate Data Field 2 identifiers to individual waste packages. The waste packager should sub-allocate the Data Field 2 identifiers issued to a site or packaging plant, in blocks to differentiate between packaging plants, waste package types and waste streams. The waste packager shall ensure that each sub-allocated block of Data Field 2 identifiers package numbers is used only for the intended waste package types and/or waste streams. The number 000000 shall not be used as a Data Field 2 identifier.

5 Quality management

The allocation and use of waste package identifiers shall be subject to the quality requirements of the relevant RWM Specification [6].

References


### Appendix A  Current allocation of waste package identifiers

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2 Identifiers from this set have been used on waste containers used for non-active commissioning trials etc.

3 WVP does not use the RWM numbering system for vitrified product containers. This batch of numbers is held for the future overpackaging of WVP products for geological disposal.