

# Geological Disposal:

Generic Specification for the stillage for the transport and disposal of 500 litre drum waste packages

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## Bibliography

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**WASTE PACKAGE SPECIFICATION AND GUIDANCE DOCUMENTATION  
SPECIFICATION FOR STILLAGE FOR THE TRANSPORT AND DISPOSAL OF 500  
LITRE DRUM WASTE PACKAGES**

### **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 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 specification defines the requirements for the stillages that would be used for the transport and disposal of waste packages manufactured using 500 litre drum waste containers.

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.

<b>WPSGD DOCUMENT NUMBER WPS/605 - VERSION HISTORY</b>		
<b>VERSION</b>	<b>DATE</b>	<b>COMMENTS</b>
WPS/605/01	July 2015	Aligns with Level 2 Generic Specification for waste packages containing low heat generating waste (NDA/RWMD/068) as published August 2012. Issued for trial use by waste producers.
WPS/605/02	August 2016	Reference 11 updated.



## 1 Introduction

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 we assist 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 [1]; 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 Generic Waste Package Specification 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 role and extent of the WPSGD, reference should be made to [2].

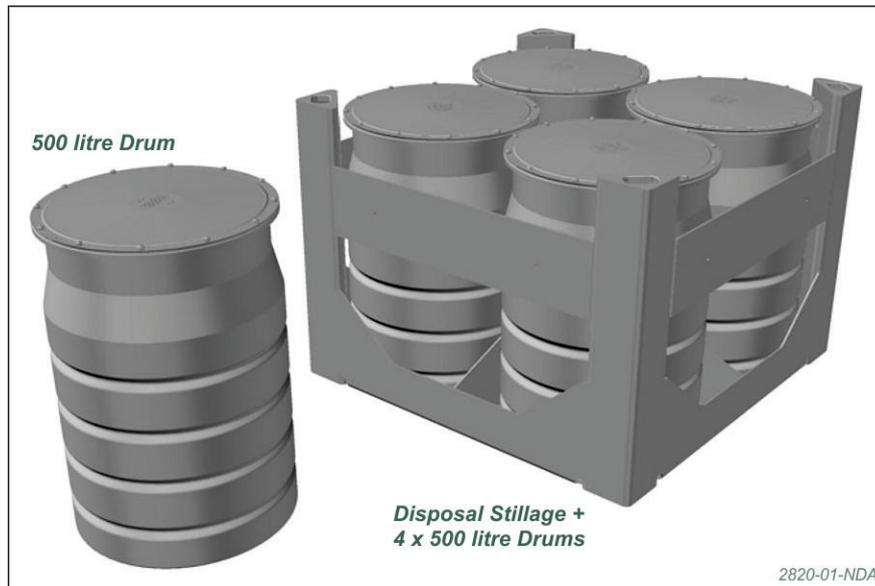
Waste packages manufactured using the 500 litre drum, a standardised design of waste container that has been shown to be suitable for the packaging of low heat generating waste for geological disposal, are expected to be transported to, and emplaced in, a GDF using stillages containing four such waste package. This specification defines the requirements for the stillages that could be used for that purpose.

The suitability of specific designs of stillage to satisfy the requirements defined would generally be assessed by way of the RWM Disposability Assessment process [3]. Such designs could be endorsed by the issue of a Letter of Compliance to indicate that they are compliant with RWM's plans for geological disposal of low heat generating waste, and with the safety cases for the transport and geological disposal of such waste. Stillage designers, manufacturers and users are therefore urged to contact RWM at an early stage in order that their designs can be assessed.

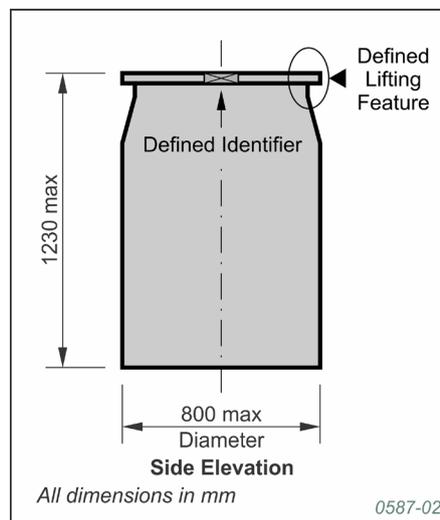
## 2 The use of stillages for the handling of 500 litre drum waste packages

The 500 litre drum (Figure 1) is a standardised design of waste container that has been shown to be suitable for the packaging of a wide range of low heat generating waste for geological disposal. The WPS for 500 litre drum waste packages defines the standard features (as illustrated in Figure 2) together with the performance requirements for such waste packages [4].

**Figure 1 500 litre drum and stillage for waste packages**



**Figure 2 Standard features of the 500 litre drum**



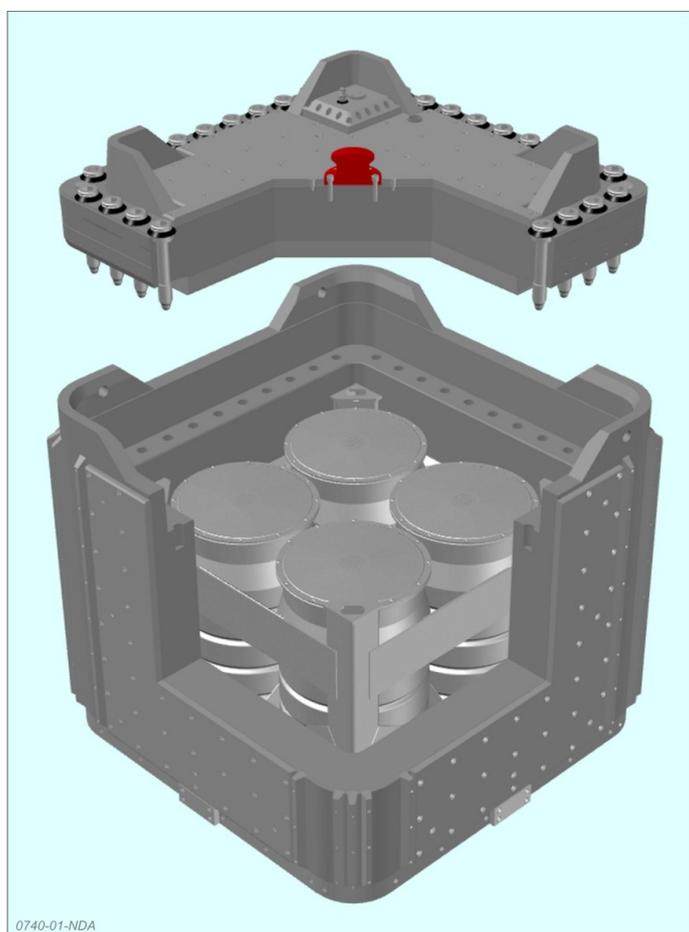
The generic Disposal System Technical Specification [5], together with the supporting generic systems designs [6, 7], assume that, for both transport to and disposal in a GDF, 500 litre drum waste packages will be handled in 2x2 arrays mounted in stillages. To date a number of stillage designs have been developed, each design reflecting the specific needs of individual waste packagers, primarily for the interim storage of waste packages prior to their export to a GDF. Figure 1 shows a group of four 500 litre drum waste

packages in a typical design of stillage, the 'compact stillage' developed by Sellafield Ltd and used extensively at that site.

The 500 litre drum waste container is used to manufacture 'unshielded waste packages', which signifies that the container is typically fabricated from relatively thin section stainless steel. As such the waste container provides little radiation shielding of the waste package radionuclide contents and, as a consequence, remote techniques are generally utilised for their handling. For this reason, it is intended to transport 500 litre drum waste packages through the public domain inside protective transport containers. Figure 3 illustrates the standard waste transport container (SWTC) which it is anticipated will be used to transport stillages containing four 500 litre drum waste packages. Three designs of SWTC are currently envisaged, providing nominal shielding thicknesses of 70mm, 150mm and 280mm of steel with a density of  $7700\text{kg m}^{-3}$ .

The transport packages that result from the combination of 500 litre drum waste packages and a SWTC will form a Type B transport package, as defined by the IAEA *Regulations for the Safe Transport of Radioactive Material* [8].

**Figure 3** Typical transport configuration for 500 litre drum waste packages



### 3 Specification for stillages for 500 litre drum waste packages

This specification defines the key features of the stillages that will be used for the transport and disposal of 500 litre drum waste packages and sets minimum standards for their performance. The requirements defined below are relevant to all stages of the long-term management of the waste packages but, in some cases, are applied at particular times during that management.

It should be noted that, where the words *shall* and *should* are used in defining the requirements which make up this WPS, their use is consistent with the recommendations of BS 7373:1998 [9] and that they have the following meaning:

- '*shall*' denotes a limit which is derived from consideration of a regulatory requirement and/or from a fundamental assumption regarding the current designs of the transport or disposal facility systems;
- '*should*' denotes a target from which relaxations may be possible if they can be shown<sup>1</sup> not to result in any significant reduction in the overall safety of the geological disposal system.

#### 3.1 General requirement for the stillage

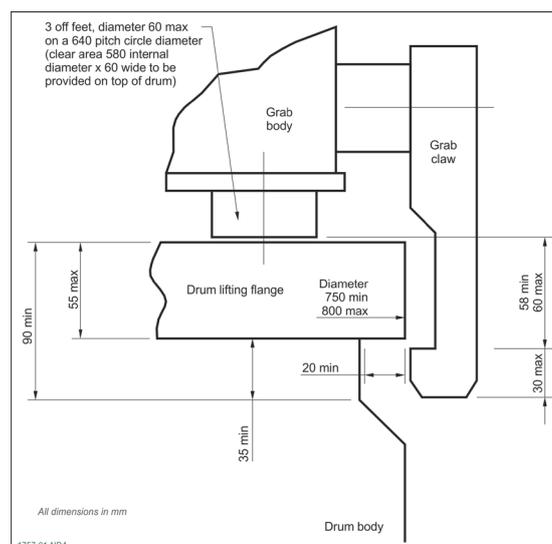
The stillage *shall* be capable of being used for the handling of four 500 litre drum waste packages manufactured in compliance with the WPS for such packages [4].

The stillage *shall* be capable of being used with fewer than four 500 litre drum waste packages.

The stillage *shall* provide adequate restraint and location of waste packages during all routine handling during transport to and emplacement in a GDF.

The stillage *shall* be designed so as to permit the simple and efficient loading and unloading of 500 litre drum waste packages by means of a standard design of lifting grab [10], using a recessed flange handling feature specified for the waste package (Figure 4).

**Figure 4 Lifting feature of the 500 litre drum**



<sup>1</sup> This would generally be by way of the Disposability Assessment process.

The loaded stillage *shall* be capable of simple and efficient insertion into and removal from a SWTC.

The stillage *shall* be designed for ease of decontamination.

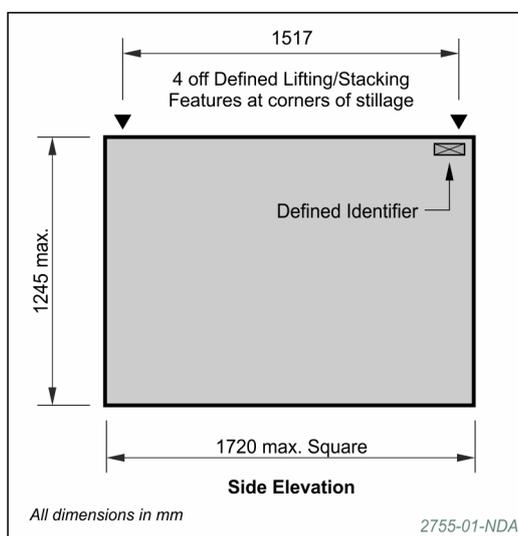
The stillage *shall* be designed to facilitate complete encapsulation and the minimisation of voids during the backfilling of the GDF disposal vaults.

The design of the stillage *shall* facilitate inspection of the external surfaces of the waste packages without the need to remove them from the stillage.

### 3.2 General properties of the stillage

The properties of the stillage, the standard features of which are shown in Figure 5, *shall* be such that it will satisfy the design requirements outlined above whilst having no significant deleterious effects on any aspect of the performance of the waste packages it contains.

**Figure 5 Standard features of the stillage for 500 litre drum waste packages**



### 3.3 External dimensions

The stillage *shall* be square in plan and the overall plan dimension *shall* not exceed 1720mm.

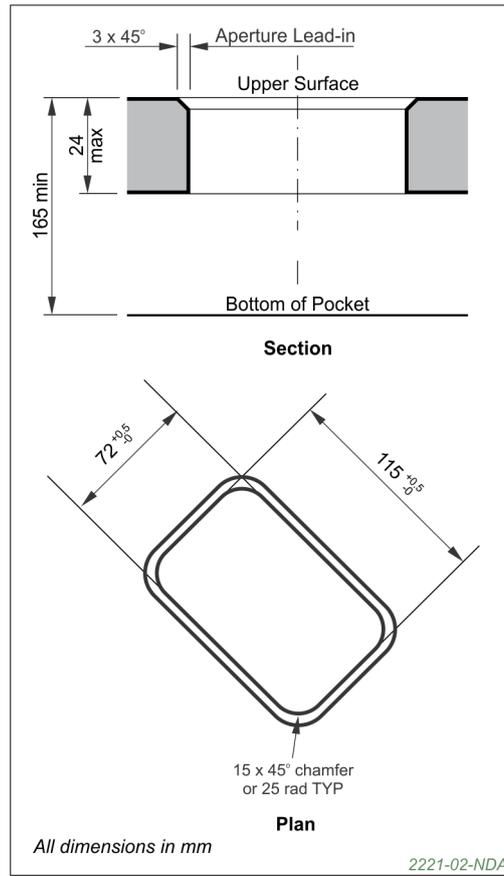
The overall height of the stillage *shall* not exceed 1245mm.

### 3.4 Handling feature

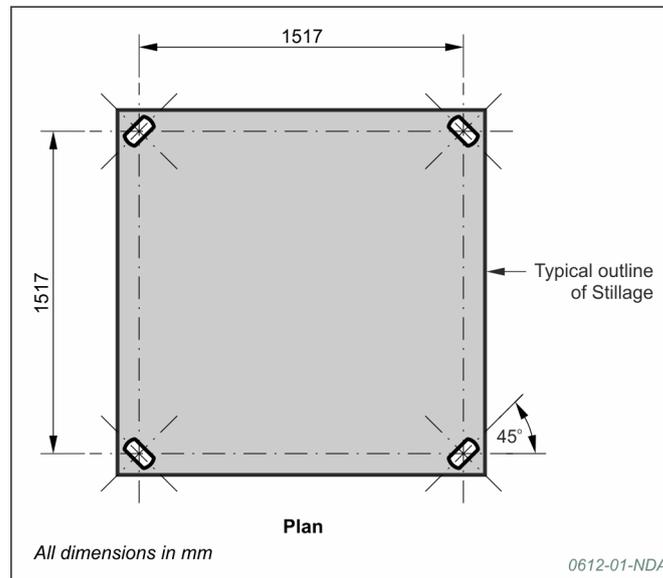
The stillage *shall* incorporate four lifting points, in the form of twistlock apertures with dimensions and geometry as defined in Figure 6 [11], located as shown in Figure 7.

The stillage *shall* be capable of being lifted with a force of 180kN using two diagonally opposite twistlock apertures, without exhibiting any permanent deformation of the stillage itself, or damage to any of the waste packages that it contains.

**Figure 6 Stillage twistlock geometry and dimensions**



**Figure 7 Layout of lifting features for stillage**



**3.5 Stackability**

The stillage *shall* be capable of withstanding a compressive load of 540kN applied evenly along its vertical axis of its corner posts. Under these load conditions, the stillage *shall* not exhibit any permanent deformation or abnormality that would render neither it, nor the waste packages that it contains, incompatible with any of the requirements for safe transport and disposal.

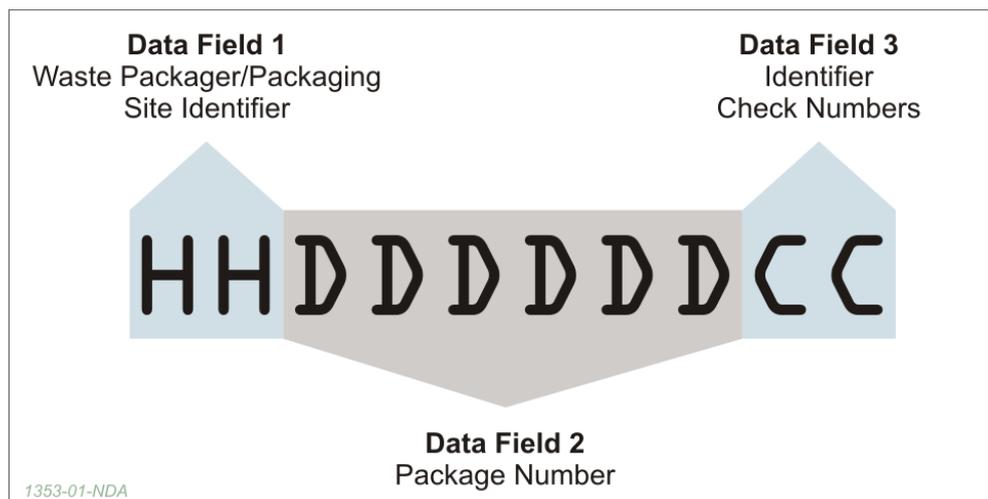
### 3.6 Identification

The stillage *shall* be marked with a unique identifier, comprising ten alpha-numeric characters each with a height of between 6mm and 10mm, and in a form that complies with the relevant RWMD specification [12] (Figure 8).

The identifier *shall* be marked on the vertical face of the twistlock plate of each right hand pillar (Figure 5).

The stillage *shall* remain identifiable by automated systems for a minimum period of 150 years following manufacture.

**Figure 8 Form of stillage identifier**



### 3.7 Durability of integrity

The integrity of the stillage *shall* be such that it is capable, when fully loaded, of being handled safely and efficiently, as required during transport and the operational period of a GDF.

The integrity of the stillage *shall* be maintained for a period of 150 years and *should* be maintained for a period of 500 years following manufacture.

### 3.8 Maximum gross mass

The gross mass of the stillage *should* not exceed 1,000kg.

### 3.9 Criticality safety

The design of the stillage *should* not include any feature that could deleteriously contribute to the criticality safety of the waste packages contained within it.

### 3.10 Accident performance

The stillage *should* be designed such that under all credible accident scenarios it will not affect the ability of the waste packages it contains to satisfy the impact performance requirements of the WPS for those waste packages [4].

## **4 Requirements for the manufacture and storage of stillages**

Adequate controls *shall* be established and applied to ensure that manufactured stillages have the properties and performance required of them.

Adequate controls *shall* be applied during any period when the stillage is used for the interim storage of waste packages to ensure that stillages retain their required properties and performance for their subsequent transport and disposal.

### **4.1 Quality management**

Adequate management arrangements *shall* be applied to all aspects of the packaging of radioactive wastes, and the storage of waste packages, that affect product quality.

These arrangements, which *shall* comply with the relevant RWM specification [13], *shall* be agreed with RWM prior to the start of the activities to which they relate.

### **4.2 Stillage data and information recording**

Information *shall* be recorded for each stillage covering all relevant details of its manufacture and interim storage. This information shall be sufficient to enable assessment of the characteristics and performance of the stillage against the requirements of all stages of long-term management.

The arrangements for data and information recording *shall* be agreed with RWM prior to the start of the activities to which they relate.

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