

Waste Services Contract

Waste Acceptance Criteria – Metallic Waste Treatment

WSC-WAC-MET – Version 3.0 – April 2012

Document Control

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Executive Summary

This document forms part of the Waste Services Contract between LLW Repository Ltd and its customers. It provides the Waste Acceptance Criteria for metallic waste being consigned to LLW Repository Ltd for treatment, by blasting or melting, and recycling prior to disposal at the Low Level Waste Repository including details of the physical, chemical, radiological, packaging and transportation requirements that waste must comply with to be accepted.

Along with the criteria for other waste services that make up the Waste Acceptance Criteria, this document details **what** waste can be consigned to LLW Repository Ltd for treatment and / or disposal. It should be read in conjunction with the Waste Acceptance Procedure that details **how** to consign waste to LLW Repository Ltd for treatment and /or disposal. A Process Overview Diagram (Reference: WSC-PRO-OVR), which provides a visual guide to the waste acceptance processes, and all other documents associated with LLW Repository Ltd's Waste Services, are available from our website: www.llwrsite.com

If you need any assistance or have any questions regarding this Waste Acceptance Criteria or LLW Repository Ltd's Waste Services, please contact the LLW Repository Ltd Customer Team by telephone: (019467) 70300 or by e-mail: customerteam@llwrsite.com

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1 Introduction

This document defines the *Waste Acceptance Criteria* for the treatment of metallic waste by *LLW Repository Ltd*. This treatment service is available to reduce the volume of metallic low level waste, by blasting or melting, prior to disposal at the *Low Level Waste Repository*.

1.1 Scope

This *Waste Acceptance Criteria* (WAC) document represents the generic requirements for the packaging, receipt, treatment, grouting and disposal of metallic low level radioactive waste. The criteria apply to each consignment of waste to *LLW Repository Ltd*.

This document outlines the potential *Metallic Waste* treatment service options that are available through *LLW Repository Ltd* and presents a composite overview of the key criteria from each *Service Supplier*. This does not necessarily represent the full range of acceptance criteria for each *Service Supplier*. *LLW Repository Ltd* will work with the *Service Suppliers* to assess wastes against their *Waste Acceptance Criteria* during the Waste Enquiry and Waste Consignment Processes.

1.2 Service Suppliers

The *Metallic Waste* Treatment Service is provided by the following sub-contractors to *LLW Repository Ltd*:

- Energy Solutions, using the following treatment facilities:
 - Bear Creek (USA)
 - Siempelkamp (Germany)
- Nuvia, using the following treatment centres:
 - Socodei (France)
- Studsvik, using the following treatment facilities:
 - Lillyhall (UK)
 - Nyköping (Sweden)

These facilities provide a range of size reduction, surface decontamination, blasting, melting, decay storage and conditioning options to support the treatment and recycling of *Metallic Waste*.

In addition, the following sorting, segregation and packaging services are available prior to treatment:

- Energy Solutions, using the segregation facility at Inutec (Winfrith, UK)
- Studsvik, using the segregation facility at Lillyhall, UK

Nuvia can provide a similar service using the segregation facility at NNL (Springfields, UK) although this route is not currently available or approved.

The suitability of waste for acceptance at a segregation facility will be considered through the Waste Enquiry Process.

1.3 Process

Customers deliver metallic *Waste Consignments* to the selected *Service Supplier's* facility or to the *Low Level Waste Repository*, for onward transport. Following treatment at the

relevant facility the exempt material is recycled and the *residual waste* is disposed of by the *Service Supplier*. If there are any *Secondary Wastes*, they are re-packaged and transported to the *Low Level Waste Repository* for grouting and disposal by *LLW Repository Ltd*. In some cases, the *Secondary Waste* may be disposed of by the *Service Supplier*.

1.4 Waste Acceptance

For a *Waste Consignment* to be accepted by *LLW Repository Ltd*, it will be necessary to ensure that waste complies with the *Waste Acceptance Criteria* of the relevant *Service Supplier*. These requirements will ultimately be defined in the Service Information within the Waste Services Quotation (Reference: WSC-TEM-WSQ) supplied by *LLW Repository Ltd* to the customer in response to a Waste Enquiry Form (Reference: WSC-FOR-WEN). Waste will only be accepted from customers in accordance with *LLW Repository Ltd's* Waste Acceptance Procedure. In addition, waste is accepted for treatment and disposal by *LLW Repository Ltd* based on the availability of sufficient volumetric and radiological capacity.

The criteria defined in this document do not necessarily represent the full range of acceptance criteria for each *Service Supplier*. These requirements will be defined in the Service Information within the Waste Services Quotation (Reference: WSC-TEM-WSQ) supplied by *LLW Repository Ltd* to the customer in response to a Waste Enquiry Form (Reference: WSC-FOR-WEN).

1.5 Variations

Variations to or waiver of the criteria defined in this document may require approval of a Waste Consignment Variation Form (Reference: WSC-FOR-WCV) by *LLW Repository Ltd* or the *Service Supplier*. If a variation is required to allow disposal of *Secondary Waste*, this will be the responsibility of the *Service Supplier*. In all cases, approval is required prior to waste being prepared for consignment.

1.6 Non-Compliant Waste

Any non-compliant wastes consigned to *LLW Repository Ltd* or the *Service Suppliers* may require collection by the customer in accordance with the relevant conditions in the Waste Services Contract.

1.7 Defined Terms

Defined terms within this document are highlighted in *italics* and their meanings are presented in the Glossary.

2 Waste Acceptance Criteria

This section details the *Waste Acceptance Criteria* for *LLW Repository Ltd's Metallic Waste Treatment Service*. It is presented in three sections:

- M1 – Physical and Chemical Properties
- M2 – Radiological Properties
- M3 – Packaging and Transport Requirements

M1 Physical and Chemical Properties

M1.1 Waste Treatment and Segregation

Waste should not be consigned for *Metallic Waste* treatment if reasonably practicable measures could be adopted to segregate its constituent parts such that alternative waste treatment and / or disposal services could be used to reduce the final volume requiring disposal at the *Low Level Waste Repository* or to avoid disposal at the *Low Level Waste Repository*.

Reasonable means shall be used to segregate *Metallic Waste* into the following categories within a *Waste Consignment*:

- Stainless Steel
- Carbon Steel
- Galvanised Steel
- Cast Iron
- Lead
- Copper
- Aluminium
- Brass

Individual *Waste Consignments* of mixed *Metallic Waste* may be acceptable, subject to approval by *LLW Repository Ltd* through the Waste Enquiry Process.

M1.2 Acceptable Metallic Waste

Only solid radioactively contaminated or activated metallic waste will be accepted for treatment by *LLW Repository Ltd* under the *Metallic Waste* treatment service.

Where waste arising from the *Metallic Waste* treatment service is to be disposed of as *Secondary Waste* at the *Low Level Waste Repository*, it must be compliant with the *Waste Acceptance Criteria* for the *Low Level Waste* disposal service (Reference: WSC-WAC-LOW) and the *Low Level Waste Repository's Environmental Permit* issued under the Environmental Permitting (England and Wales) Regulations 2010 by the Environment Agency (Reference: EPR/YP3293SA). *LLW Repository Ltd* will determine if the *Secondary Waste* will meet the *Waste Acceptance Criteria* requirements during the Waste Enquiry Process. *LLW Repository Ltd* is responsible for the disposal of any *Secondary Waste* and compliance with the *Waste Acceptance Criteria*.

The following table outlines the materials that are generally accepted and those that are restricted by the *Metallic Waste Service Suppliers*:

Table 1: Acceptable and Restricted Materials

Acceptable Metallic Waste	Restricted Metallic Waste	Restricted Non-Metallic Waste
Carbon steel	Zinc galvanised metal	Asbestos
Stainless steel	Mercury	Free liquids
Cast iron		Sealed Sources
Aluminium		Soluble Solids
Copper		Bituminous or other linings
Lead		Boron
Brass		Strong Oxidising Agents
Cables		Putrescible Waste
Cable insulation		Armoured cables, pyro-cables and cables containing tensioning wires
		Pressurised containers e.g. redundant gas bottles, fire extinguishers etc.
		Toxic and hazardous materials and wastes
		Ion exchange resins, organic as well as inorganic resins
		Cans of paint, grease, aerosols, or other organic materials
		Non-metallic materials such as rubber, plastic, or other organic materials
		Chemical Complexing or Chelating Agents
		Biological, Infectious and Pathogenic Materials
		Explosives, self-igniting or reactive metals or materials

M1.3 Non-Waste Materials

Where materials must be added to the waste, the customer shall use reasonable means to limit the quantity of non-waste materials present in a *Waste Consignment*. It is not acceptable to purposely dilute waste or add shielding materials for the sole purpose of achieving compliance with the requirements of this *Waste Acceptance Criteria*.

M2 Radiological Properties

M2.1 Radioactivity Limits

Service Supplier specific criteria for *Activity* limits apply for *Metallic Waste Items*. Specific restrictions will be determined through the Waste Enquiry Process. However, the following criteria provide a general guide:

Table 2: Activity Limits for *Metallic Waste Items*

Radionuclide	Specific Activity (GBq/t)		
	Acceptable	Likely to be Accepted	Maybe Accepted
All alpha	<0.5	<1	<4
All beta/gamma	<0.5	<10	<12

Where waste arising from the *Metallic Waste* treatment service is to be disposed of as *Secondary Waste* at the *Low Level Waste Repository*, the activity of this waste shall not exceed the following values:

- 4 GBq/t for all alpha-emitting radionuclides
- 12 GBq/t for all other radionuclides

In accounting for *Activity* against these limits, the activity of *Decay Products* with half-lives of less than three months shall not be accounted for if they are present in amounts not exceeding those which could be present through the natural decay of radionuclides that are accounted for.

LLW Repository Ltd will confirm that *Secondary Waste* to be disposed of at the *Low Level Waste Repository* will meet the radioactivity limits during the Waste Enquiry Process. *LLW Repository Ltd* is responsible for the disposal of any *Secondary Waste* and compliance with the *Waste Acceptance Criteria*.

M2.2 Fissile Radionuclides

Service Supplier specific criteria may be applicable limiting the quantity of *Fissile Radionuclides* in a *Metallic Waste Consignment*. Specific restrictions will be determined through the Waste Enquiry Process.

Where waste arising from the *Metallic Waste* treatment service is to be disposed of as *Secondary Waste* at the *Low Level Waste Repository*, any waste containing *Fissile Radionuclides* must meet the limits for *Fissile Radionuclides* in *Waste Acceptance Criteria* - *Low Level Waste Disposal* (Reference: WSC-WAC-LOW).

LLW Repository Ltd will confirm that *Secondary Waste* to be disposed of at the *Low Level Waste Repository* will meet the *Fissile Radionuclide* limits during the Waste Enquiry Process. *LLW Repository Ltd* is responsible for the disposal of any *Secondary Waste* and compliance with the *Waste Acceptance Criteria*.

M2.3 Radiation Limits

The average surface dose rate of any *Waste Item* must not exceed 0.2 mSv/h.

The maximum radiation level at any point on the external surface of the *Transport Container* shall not exceed 2 mSv/h and 100 µSv/h at 2 metres.

In addition, *Service Supplier* specific criteria may apply. Specific restrictions will be determined through the Waste Enquiry Process.

M2.4 Contamination

Items will generally be accepted for treatment if the maximum external non-fixed contamination on any items is less than 5 Bq/cm² for all alpha-emitting radionuclides and less than 100 Bq/cm² for all other radionuclides. *Service Supplier* specific criteria may apply. Specific restrictions will be determined through the Waste Enquiry Process.

External non-fixed contamination levels on the *Transport Container* at the time of consignment shall be as low as reasonably practicable and in any case not more than 0.4 Bq/cm² for all alpha-emitting radionuclides and 4 Bq/cm² for all other radionuclides averaged over an area of 300 cm².

M3 Packaging and Transport Requirements

M3.1 Approved Waste Packages and Transport Containers

Waste for treatment may be consigned to *LLW Repository Ltd* or the *Service Suppliers* in a wide range of *Waste Packages* and *Transport Containers*.

The acceptable range of *Waste Packages* includes metal boxes (e.g. Berglof Boxes), plastic boxes (e.g. Dolav Boxes) and metal stillages

The acceptable range of *Transport Containers* for consignment includes: 1/3 Height, 1/2 Height and Full Height ISO Containers.

The *Waste Packaging* and *Transport Container* options will be determined by the customer and *LLW Repository Ltd* through the Waste Enquiry Process. The chosen option will be specified in a Waste Loading Plan (Reference: WSC-FOR-WLP).

M3.2 Non-Containerised Waste

Non-containerised waste may be accepted for treatment by *LLW Repository Ltd* but only on approval of a Waste Loading Plan (Reference: WSC-FOR-WLP).

M3.3 Maximum Weight and Packaging Restrictions

Service Supplier specific criteria apply to the maximum weight of an item of waste. Specific restrictions will be determined through the Waste Enquiry Process.

M3.4 Packing Efficiency

Customers are responsible for loading the *Transport Container* and / or the *Primary Containment* so that, as far as reasonably practicable, waste is packaged in such a way as to maximise the use of the *Transport Container* in accordance with the relevant Waste Loading Plan (Reference: WSC-FOR-WLP) for the *Waste Consignment*.

M3.5 Photographic Records

Where required by the Waste Packing Plan (Reference: WSC-TEM-WPP) for the relevant *Waste Consignment*, customers are responsible for ensuring that, as far as reasonably practicable, photographic records of the step-by-step filling of the *Transport Container* with waste are produced and retained by the customer.

M3.6 Transport Regulations

Waste must be *consigned* for treatment or disposal in accordance with the latest edition of IAEA TS-R-1 (Safe Transport of Radioactive Material Regulations), as required by The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (or as amended) and ADR, under one of the following classifications:

- Excepted Package
- Low Specific Activity material (LSA I, LSA II)
- LSA III (subject to confirmation of the leaching test specified in IAEA TS-R-1)
- Surface Contaminated Object (SCO I or SCO II)

Customers are responsible for ensuring compliance with the transport regulations and the Certificate of Approval for the specific container design including the requirements of any associated packing and handling instructions.

In addition, any *Waste Consignment* or *Disposal Container* that does not, in its own right, comply with the requirements of the current transport regulations and requires additional shielding or an overpack to achieve compliance, may be accepted for disposal but only on approval of a Waste Consignment Variation Form (Reference: WSC-FOR-WCV) by *LLW Repository Ltd*.

M3.7 Transport of Fissile Radionuclides

Waste transported in IP-2 containers may contain very low quantities or very low concentrations of *Fissile Radionuclides* when classified as Fissile Excepted Packages. In order to use the Fissile Excepted Package classification, one of the fissile exemption criteria in the Transport Regulations must be satisfied and the justification documented.

Please note that the fissile excepted criteria do not always align with the criteria for *Fissile Radionuclides* in M2.2.

Customers must contact *LLW Repository Ltd* for advice if they intend to consign waste to *LLW Repository Ltd* or the *Service Suppliers* that contains *Fissile Radionuclides* above the fissile excepted criteria, prior to loading waste.

Customers must ensure they fulfil the requirements of these *Waste Acceptance Criteria* and the Transport Regulations when consigning *Fissile Radionuclides* to *LLW Repository Ltd*.

M3.8 Part Loads

A *Waste Consignment* may not be consigned to *LLW Repository Ltd* if sent as a part-load with other materials that are not *Low Level Waste* on the same vehicle.

M3.9 Site Rules and Instructions

When delivering waste to *LLW Repository Ltd* for treatment, the customer's representatives must observe the site rules and instructions at either the *Service Supplier's* site or the *Low Level Waste Repository*.

M3.10 Transport Container Return

Where the *Transport Container* belongs to the customer, *LLW Repository Ltd*, or its subcontractor, will unload the contents of the *Transport Container* and ensure that it is available for return within the timescale agreed with the customer, in as good a condition as it was when delivered, subject to fair wear and tear.

3 Glossary

Activity, expressed in Becquerels, means the number of spontaneous nuclear transformations occurring in a period of one second.

Consign, in the context of waste, means to transfer waste to *LLW Repository Ltd*, or to a *Service Supplier's* facility, for the purpose of onward transfer, treatment or disposal and *Consigned* has a corresponding meaning.

Decay Products means those radionuclides succeeding another radionuclide in the radioactive decay chain in which both, or all, occur.

Environmental Permit means the Environmental Permit for the Low Level Waste Repository (Reference: EPR/YP3293SA) issued under the Environmental Permitting (England and Wales) Regulations 2010 by the Environment Agency.

Fissile Radionuclides means any of the following radionuclides:

Th-228	Np-237	Pa-231	Cm-243	Cf-249
U-232	Pu-238	Pa-232	Cm-244	Cf-250
U-233	Pu-239	Am-241	Cm-245	Cf-251
U-234	Pu-240	Am-242m	Cm-246	Cf-252
U-235	Pu-241	Am-243	Cm-247	Es-254
U-236	Pu-242			

Free Liquid means any liquid which is present as a separate phase including liquid which is physically absorbed onto a solid matrix rather than chemically combined. This can include water, oil and/or solvents.

Hazard Properties means the following properties of waste, which render them hazardous in accordance with the Hazardous Waste (England and Wales) Regulations 2005:

- H1 “Explosive”: substances and preparations which may explode under the effect of flame or which are more sensitive to shocks or friction than dinitrobenzene.
- H2 “Oxidising”: substances and preparations, which exhibit highly exothermic reactions when in contact with other substances, particularly flammable substances.
- H3-A “Highly Flammable”:
 - liquid substances and preparations having a flash point below 21°C (including extremely flammable liquids), or
 - substances and preparations which may become hot and finally catch fire in contact with air at ambient temperature without any application of energy, or
 - solid substances and preparations which may readily catch fire after brief contact with a source of ignition and which continue to burn or to be consumed after removal of the ignition source, or
 - gaseous substance and preparations which are flammable in air at normal temperature and pressure, or
 - substances and preparations, which in contact with water or damp air evolve highly flammable gases in dangerous quantities.
- H3-B “Flammable”: liquid substances and preparations having a flash point equal to or greater than 21°C and less than or equal to 55°C.

- H4 “Irritant”: non-corrosive substances and preparations, which, through immediate, prolonged or repeated contact with the skin or mucous membrane, can cause inflammation.
- H5 “Harmful”: substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may involve limited health risks.
- H6 “Toxic”: substances and preparations (including very toxic substances and preparations) which, if they are inhaled or ingested or if they penetrate the skin, may involve serious, acute or chronic health risks and even death.
- H7 “Carcinogenic”: substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may induce cancer or increase its incidence.
- H8 “Corrosive”: substances and preparations, which may destroy living tissue on contact.
- H9 “Infectious”: substances containing viable microorganisms or their toxins, which are known or reliably believed to cause disease in man or other living organisms.
- H10 “Teratogenic”: substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may induce non-hereditary congenital malformations or increase their incidence.
- H11 “Mutagenic”: substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may induce hereditary genetic defects or increase their incidence.
- H12 Substances and preparations, which release toxic or very toxic gases in contact with water, air or an acid.
- H13 Substances and preparations capable by any means, after disposal, of yielding another substance, e.g. a leachate, which possesses any characteristics listed above.
- H14 “Ecotoxic”: substances and preparations, which present or may present immediate or delayed risks for one or more sectors of the environment.
- H15 Waste capable by any means, after disposal, of yielding another substance, e.g. a leachate, which possesses any of the characteristics above

Hazardous Substance(s) means any substance or group of substances that are toxic, persistent and liable to bioaccumulate. This includes the following when they are toxic, persistent and liable to bio-accumulate:

- organohalogen compounds and substances which may form such compounds in the aquatic environment
- organophosphorous compounds
- organotin compounds
- substances and preparations, or the breakdown products of such, which have been proved to possess carcinogenic or mutagenic properties or properties which may affect steroidogenic, thyroid, reproduction or other endocrine-related functions in or via the aquatic environment
- persistent hydrocarbons and persistent and bioaccumulable organic toxic substances
- cyanides
- metals (in particular cadmium and mercury) and their compounds
- arsenic and its compounds

- biocides and plant protection products

Ion Exchange Material means any material, whether synthetic or naturally occurring, that has the capability of interchanging ions from one substance to another by means of a reversible chemical or physical process.

LLW Repository Ltd means the waste management company that holds the Site Licence to manage and operate the *Low Level Waste Repository* under contract to the owner of the site, the Nuclear Decommissioning Authority.

Low Level Waste means solid low level radioactive waste in accordance with the requirements specified in this *Waste Acceptance Criteria* document. It typically includes metals, soil, building rubble and organic materials, which arise principally as lightly contaminated miscellaneous scrap. Metals are mostly in the form of redundant equipment. Organic materials are mainly in the form of paper towels, clothing and laboratory equipment that have been used in areas where radioactive materials are used, such as hospitals, research establishments and the nuclear industry. Low Level Waste contains radioactive materials other than those acceptable for disposal with municipal and general commercial or industrial waste.

Low Level Waste Repository means the national low level radioactive waste disposal facility situated near the village of Drigg in West Cumbria.

Metallic Waste means those wastes for which the best available technique for management is treatment by decontamination, blasting or melting. *Metallic Waste* can typically consist of: scaffolding, pipes, tubing, valves, structural elements, cabinets, plant items, heat exchangers, turbines, etc.

Non-Hazardous Pollutant means any substance liable to cause pollution other than a *Hazardous Substance*.

Packing Efficiency means the extent to which the internal volume in a *Transport Container* is fully utilised.

Primary Containment means the first level of containment using closed containers such as Dolav boxes, Berglof boxes or UN approved drums.

Putrescible Materials means materials liable to be readily decomposed by micro-organisms, excluding wood and paper.

Reactive Metals means those elements located in Group IA, first column, of the periodic table, (alkali metals) and those elements located in Group IIA, second column, of the periodic table (alkaline earth metals).

Residual Waste means waste such as packaging and wrapping that cannot be treated or processed.

Secondary Waste means waste for disposal at the *Low Level Waste Repository* that arises from a treatment process completed by *LLW Repository Ltd* for a customer under the *Waste Services Contract*.

Service Supplier means the sub-contractor that *LLW Repository Ltd* uses to deliver the *Metallic Waste* treatment service as defined in Section 1.2.

Soluble Solids means any solid chemical compound that is indicated as having a soluble or slightly soluble property in water in the latest edition of the CRC “Handbook of Chemistry and Physics”

Transport Container means those containers, as defined in M3.1, that are approved for use to *Consign a Waste Consignment* to *LLW Repository Ltd* for treatment.

Waste Acceptance Criteria means the requirements set out in this document and the Waste Acceptance Criteria Overview (Reference: WSC-WAC-OVR) and relevant Statutory Regulations applicable to the customer in respect of the transport, treatment and disposal of *Low Level Waste*.

Waste Consignment means one *Transport Container* and its contents of waste and packaging with a maximum external volume of 40 m³, received from a single customer on one road or rail vehicle as specified in the Waste Consignment Information Form (Reference: WSC-FOR-WCI).

Waste Item means an individual item of *Metallic Waste*.

Waste Package means those packages, such as drums and bags, as defined in M3.1, that are approved for use to consign *Metallic Waste* to *LLW Repository Ltd* for treatment.