METAL RECYLING FACILITY - WASTE ACCEPTANCE CRITERIA

Ref: WAC/MM
## Contents

<table>
<thead>
<tr>
<th>CONTENTS</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTENTS</td>
<td>1</td>
</tr>
<tr>
<td>1  INTRODUCTION</td>
<td>2</td>
</tr>
<tr>
<td>2  ACCEPTANCE OF MATERIAL AT THE MRF</td>
<td>3</td>
</tr>
<tr>
<td>3  NORMAL OPERATING PARAMETERS</td>
<td>4</td>
</tr>
<tr>
<td>4  TREATABILITY MODEL</td>
<td>7</td>
</tr>
<tr>
<td>5  SECONDARY WASTE</td>
<td>9</td>
</tr>
<tr>
<td>6  RETURN OF NON-COMPLIANT WASTES AND MATERIALS NOT ACCEPTED</td>
<td>9</td>
</tr>
<tr>
<td>7  TRANSPORTATION</td>
<td>10</td>
</tr>
<tr>
<td>8  DELIVERY</td>
<td>10</td>
</tr>
</tbody>
</table>
1 INTRODUCTION

1.1 This document sets out the Waste Acceptance Criteria (WAC) for the Cyclife Waste Metal Treatment Service.

1.2 These Criteria cover the requirements for acceptance of metallic wastes into the Cyclife Metal Recycling Facility (MRF) and, where applicable, the Cyclife facility at Nyköping, Sweden.

1.3 This document also reviews requirements for the optional return of secondary wastes generated during treatment to Customers or, alternatively, for retention of the secondary wastes by Cyclife. The arrangements specified within the Contract Documents will state which of these provisions apply in a particular case.

1.4 The detailed criteria set out below describe the Normal Operational Parameters for the acceptance and treatment of metallic wastes. These Normal Operating Parameters are simple, usable and provide a robust basis for identifying metals that are treatable by Cyclife. Waste lying outside these Normal Operating Parameters needs individual assessment and cannot therefore be accepted unless detailed individual assessment are made.

1.5 Cyclife is able to consider a wide range of materials for treatment. Our process operations are designed for maximum flexibility allowing a wide range of metallic LLW, which may fall outside the Normal Operating Parameters, to be successfully processed. Advance notice of such materials, to allow proper and detailed assessment, is of course required.

1.6 This document now includes acceptance limit for waste material generated from NORM industrial activities. A bulk activity limit of 40 Bq g\(^{-1}\) for NORM has been derived based on the ensuring the bulk activity of the secondary waste is less than 200 Bq g\(^{-1}\) thus enabling its disposal at a licensed Landfill authorised to accept radioactive waste below this level.

1.7 For such waste a Treatability Model is applied by Cyclife to determine wastestream specific Waste Acceptance Criteria which can then be utilised as a basis for a decision regarding the possible acceptance of these wastes.

1.8 A separate document, ‘Metal Treatment Service – Consignor Guidance’ provides further details.

1.9 Cyclife reserve the right to vary these Waste Acceptance Criteria from time to time and to advise Customers accordingly.
2 ACCEPTANCE OF MATERIAL AT THE MRF

2.1 Waste to be treated must only be surface contaminated metallic waste within UK Low Level Waste (LLW) definitions, i.e. specific activity below 4,000Bq/g alpha emitting nuclides and below 12,000Bq/g beta/gamma emitting nuclides on any accessible or non-accessible surface.

2.2 For low level metallic waste to be accepted by Cyclife for treatment in accordance with these Waste Acceptance Criteria, the radioactive activity for any single item must be no greater than 500Bq/g. The mean alpha activity concentration, i.e. the sum of fixed and loose contamination, at any location cannot exceed 25Bq/cm². The mean beta activity concentration, i.e. the sum of fixed and loose contamination, per unit area at any location cannot exceed 250 Bq/cm².

2.3 If at any time during the processing of metallic waste radioactive activity is found that is greater than those limits given above then the items concerned will be deemed to fall outside of the Normal Operating Parameters and Cyclife UK reserve the right to return these items to the customer at the customer’s expense and receive payment for treatment undertaken to date.

2.4 Further details of the proportion of loose contamination acceptable are found in Section 3.1.2.

2.5 In addition to this there are a number of general criteria to be complied with in order to ensure that the waste can be successfully processed, all as detailed herein. Not all types of metallic waste can be accepted by Cyclife, and examples of exceptions are described within this document.

2.6 The acceptance of any material for processing is subject to the Customer’s prior submission of Form 247 “Application for Waste Treatment at the Metals Recycling Facility” (see “Initial Enquiries and Delivery Information”) and subsequent signed approval by Cyclife. The information given on Form 247 will be assessed using Cyclife Internal Form 248 and the results of the assessment and/or any further queries will be communicated to the Customer.

2.7 This contains the information required to determine whether the metals fall within these Normal Operating Parameters. The Form must be submitted at least 14 days prior to the proposed shipping date.

2.8 Form 249 “Intent to Consign” must be completed by the Customer and approved by Cyclife prior to any delivery.

2.9 Cyclife reserves the right to inspect materials before or after delivery and to audit Customer processes to determine if the materials are in accordance with these Waste Acceptance Criteria. This may include an audit of the Customer’s process for determining the nuclide fingerprint of the materials.

2.10 Customers must contact Cyclife in advance when they consider that their waste may fall outside the Normal Operating Parameters to avoid incurring the additional expense associated with the waste being rejected. The application of a Treatability Model can then be considered.
3 NORMAL OPERATING PARAMETERS

3.1 The following are the criteria for acceptance of Metallic Waste for processing under the Normal Operating Parameters:

3.1.1 Material Characteristics

(i) General containerised metallic scrap must only contain directly treatable items. It must not include complex assemblies (pumps, motors etc).

(ii) Materials shall be limited to carbon and stainless steel, cast iron, aluminium, copper, lead or brass.

(iii) Treatable material thickness must be greater than 3 mm (i.e. excluding rust, paint etc.).

(iv) Metal waste should be either uncoated or have a nominal painted finish limited to metallic or painted surface coatings. Thick paint, bitumen, epoxy or other thick coatings or deposits will require prior approval.

(v) Cables must only have copper and/or aluminium conductors. Insulation must only be PVC. Minimum length of cables 100mm, minimum diameter 3mm, maximum diameter 50mm. Single or multi strand conductors are acceptable.

(vi) Waste must be contained within a standard ISO container. Un-containerised waste or waste in non-standard containers requires prior agreement.

(vii) Individual items must not exceed 4,500kg. Weights above this limit must be agreed in advance with Cyclife to ensure that suitable arrangements are made for their removal and transport within the facility.

(viii) Straight pipework must have a nominal diameter greater than 100 mm. Angled pipework and pipework with diameters less than 100 mm require prior agreement.

3.1.2 Radiological characteristics (General)

(i) Contact gamma dose rate of all materials must be no greater than 0.2 mSv/h, averaged per item, with no hot spots above 0.5 mSv/h.

Where dose rates above 0.2 mSv/h are measured, the Customer must identify these by permanent marking.

(ii) Dose rate at 1m must be no greater than 0.1 mSv/h.

(iii) Mean specific activity per item must be no greater than 500 Bq/g.
(iv) The activity at any location must not exceed the values given in the table below:

<table>
<thead>
<tr>
<th></th>
<th>Loose contamination (Bq/cm²)</th>
<th>Fixed+Loose contamination (Bq/cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean alpha</td>
<td>5</td>
<td>25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Loose contamination (Bq/cm²)</th>
<th>Fixed+Loose contamination (Bq/cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean beta</td>
<td>100</td>
<td>250</td>
</tr>
</tbody>
</table>

No part of any item may have a surface activity concentration greater than twice the values given in the table above.

Hot spots must be identified by permanent marking.

3.1.3 Radiological characteristics - NORM contaminated materials

(i) Waste material contaminated with Naturally Occurring Radioactive Material (NORM) can be treated under Normal Operating Parameters, if it has arisen from one of the NORM Industrial Activities listed in Table 1

<table>
<thead>
<tr>
<th>Table 1. NORM Industrial Activities</th>
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<tbody>
<tr>
<td>Extraction, production and use of rare earth elements and rare earth element alloys</td>
</tr>
<tr>
<td>Mining and processing of ores other than uranium ore</td>
</tr>
<tr>
<td>Production (but not storage, distribution or use) of oil and gas</td>
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<tr>
<td>Removal and management of radioactive scales and precipitates from equipment associated with industrial activities</td>
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<tr>
<td>Any industrial activity utilising phosphate ore</td>
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<tr>
<td>Manufacture of titanium dioxide pigments</td>
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<tr>
<td>The extraction and refining of zircon and manufacture of zirconium compounds</td>
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<tr>
<td>Production of tin, copper, aluminium, zinc, lead and iron and steel</td>
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<tr>
<td>Activities related to coal mine de-watering plants</td>
</tr>
<tr>
<td>China clay extraction</td>
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<tr>
<td>The remediation of contamination from other NORM industrial activities</td>
</tr>
</tbody>
</table>
(ii) For waste material generated from one of the NORM industrial activities, listed in Table 1, the bulk activity of the material must not exceed 40 Bqg.

The 40 Bqg-1 limit for NORM has been derived based on the activity of the secondary waste being less than 200 Bqg-1 and disposed of to a licensed VLLW Landfill site.

(iii) Waste material arising from NORM industrial activities and only contaminated with naturally occurring radionuclides in particular those primordial nuclides associated with the U-238, U-235 and Th-232 decay chains (see Table 2).

Table 2. Radionuclides associated with NORM Industrial Activities

<table>
<thead>
<tr>
<th>Radionuclide</th>
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<tr>
<td>U-238 (and decay progeny)</td>
</tr>
<tr>
<td>U-235 (and decay progeny)</td>
</tr>
<tr>
<td>Th-232 (and decay progeny)</td>
</tr>
</tbody>
</table>

(iv) The naturally occurring radionuclides including K-40 are out of scope of the legislation and therefore they do not need to be taken into account when assessing if total bulk activity of the waste is less than 40 Bqg-1.

3.1.4 The following list provides examples of materials which cannot be processed by Cyclife. This is not an exhaustive list.

- Non-metallic materials such as rubber, plastic, or other organic materials
- Ion exchange resins, organic as well as inorganic resins
- Free liquids (no liquids of any kind are permissible)
- Cans of paint, grease, aerosols, or other organic materials
- Pressurised containers e.g. redundant gas bottles, fire extinguishers etc.
- Toxic materials
- Materials containing asbestos
- Materials that may cause explosion or self-ignition
- Armoured cables, pyro-cables and cables containing tensioning wires
- Other materials not meeting the Waste Acceptance Criteria for the Low Level Waste Repository as published by LLWR.

Zinc-galvanized metals or any other metals not listed as acceptable for treatment in the Normal Operating Parameters may be considered for treatment following an assessment under the Treatability Model described below.
4 TREATABILITY MODEL

4.1 For metallic LLW falling outside the Normal Operating Parameters, a Treatability Model is utilised to investigate and where possible identify a potential form of treatment. Note that materials subject to assessment under this Treatability Model that are consigned by the Customer without Cyclife’s prior agreement are subject to return or alternative method of disposal in accordance with regulatory requirements at the Customer’s expense.

4.2 The Treatability Model is managed by our consignor support personnel and technical staff providing an interface with the consignor to ensure the waste is accurately assessed and assigned to the appropriate treatment process lifecycle.

4.3 Waste with any of the following properties has to be assessed through the treatability model;

- Materials other than: steel (carbon and stainless), cast iron, aluminium, copper, lead, brass; and cables with copper and/or aluminium conductor
- Zinc galvanized materials
- Material thickness less than 3 mm
- Individual item weight over 4,500kg
- Un-containerised waste not delivered in a standard ISO container.
- Thick coatings on metal surfaces, for example paint, bitumen and epoxy
- Contact dose rate over 0.2 mSv/h, averaged per item
- Hot spots above 0.5 mSv/h
- Dose rate at 1m over 0.1 mSv/h
- Mean specific activity per item > 500 Bq/g
- Mean activity concentration greater than those values in Section 3.1.2.
- Neutron activated materials
- Enrichment of uranium >5% by mass

4.4 The level of treatability of metallic waste not meeting Normal Operating Parameters is dependent on one or more of the following factors:

- Dose rate constraints and ALARP principles at all Cyclife facilities
- Radionuclide fingerprint and specific activity
- Size of items for waste that cannot be transported in standard containers
- Thickness of material for blasting processes
- Secondary waste generation and its classification
- Enrichment of uranium and other fissile nuclides
- Specific details of complex assemblies
- Compliance with Conditions for Acceptance at the UK Low Level Waste Repository (LLWR)
- Cyclife EPR’10 limits
- Hazards that may be non-radiological
4.5 Cyclife’s extensive operational experience, database and on-going research and development in the area of metals recycling can efficiently provide the optimum treatment route for a wide variety of waste characteristics.

4.6 Cyclife can normally treat items with dose rates in excess of the Normal Operating Parameters by utilisation of shielded cutting and treatment facilities at MRF and Cyclife Sweden. Assessment for potential treatment will be made by Health Physics professionals at our facilities.

4.7 Cyclife will assess the radionuclide fingerprint and specific activity of wastes outside the Normal Operating Parameters to assess the likelihood of release of the material from regulatory control after treatment, as well as the classification of any secondary wastes generated that will require disposal.

4.8 Waste treated by Cyclife at the MRF will, wherever practicable, be disposed of under EPR10, as ‘Out of Scope’ with no further regulatory controls required. A proportion of waste may require further treatment (melting) by Cyclife in Sweden. For wastes treated in Sweden, release of material is controlled in line with criteria of European Commission report Radiation Protection 89 (Recommended radiological protection criteria for the recycling of metals from the dismantling of nuclear installations). This assessment step will consider the fate of each nuclide in the treatment process and the requirements to achieve controlled release of the treated metals.

4.9 Wastes with any significant level of activation may be treatable but will require prior assessment via this step, as are wastes with enriched uranium or other fissile nuclides.

4.10 Large or heavy items up to 500 tonnes may be processed by Cyclife at our facility in Sweden, subject to prior assessment and agreement. Typically these items might include tanks, vessels and steam generators.
   Cyclife will consider the overall processing arrangements to develop a Treatability Model for the wastes.

4.11 Material of thickness 3 mm or less requires assessment to determine treatability, as the effectiveness of our blasting processes need to be carefully considered when processing thin material.

4.12 Cyclife can potentially treat complex assemblies and machinery such as motors and pumps following an assessment of the item to determine the working time required and net benefits of their disassembly. Wastes out-with the activity limits prescribed in our Normal Operating Parameters may have the potential to generate secondary wastes that cannot be disposed to LLWR. In these cases, Cyclife will undertake a prior assessment of the characteristics of the secondary wastes produced to determine if they can be suitably disposed of.

4.13 Further guidance on the treatability model can be found in Cyclife’s ‘Metal Treatment Service – Consignor Guidance’ documentation.
5 SECONDARY WASTE

5.1 Where the option for return of the secondary wastes to the Customer has been selected:

(a) Cyclife shall provide a basic technical summary of the secondary wastes produced including the total weight and activity as measured by high resolution gamma spectroscopy. Should additional sampling of the secondary wastes be required this will be by means of a separate agreement with Cyclife.

(b) It must be noted that Cyclife’s Metal Treatment Facility also treats wastes from other Customers. Cyclife shall make reasonable efforts to remove loose and readily removable debris prior to treatment, but minor cross-contamination with material from previous processes may occur, and this shall be included within any Secondary Waste returned to the Customer and accepted by him.

6 RETURN OF NON-COMPLIANT WASTES AND MATERIALS NOT ACCEPTED

6.1 Should Cyclife determine, either at the point of delivery or following unpacking, that any waste includes non-compliant items lying outside these Waste Acceptance Criteria, the waste, item or consignment shall be transferred to the reject area of the facility and the Customer notified.

6.2 Cyclife then reserve the right at the Customer’s expense to either return the total waste, item or consignment containing the non-compliant items to the Customer or make alternative arrangements for disposal in accordance with the regulatory regime then in effect.

6.3 All costs incurred by Cyclife as a result of non-compliant wastes shall be to the Customer’s account. This may include the costs of reviews with Regulatory authorities, and Regulator costs if applicable.

6.4 Consignments containing Waste items with mean specific activity above 500Bq/g and/or with activity concentrations greater than those in Section 3.1.2 will be rejected unless prior agreement has been received from Cyclife.

6.5 At Cyclife’s option, a suitable treatment model for wastes determined as non-compliant following delivery to Cyclife may be investigated. However no undertaking to investigate a treatment model can be given if a request to treat non-compliant wastes has not been submitted by the Customer a minimum of 30 days prior to the proposed shipment date.

6.6 The investigation of treatment models for non-compliant wastes where prior notice has been given as noted above is normally at no additional cost to the Customer. However
the costs of any such investigation for non-compliant wastes delivered without prior agreement shall be to the Customer’s account.

6.7 The Customer shall be required to sign a Waste Return Guarantee to confirm acceptance of non-compliant wastes, and also for the return of secondary wastes where this option has been selected.

7 TRANSPORTATION

7.1 Transportation of materials to the Cyclife facility shall be by the Customer, unless by prior agreement.

7.2 The Customer shall also act as consignor of the waste and be responsible for preparation of all documentation, and receipt of all approvals, relating to the shipment to Cyclife unless otherwise stated within the Contract. Note that for any international shipment, all requisite cross-border arrangements must be in place.

7.3 Documentation relating to the transfer of material between Cyclife MRF and the Cyclife facility at Nykoping, Sweden shall be arranged by Cyclife.

7.4 Containers without fork lift tunnels shall be subject to an additional handling charge unless specifically stated as included within the Contract Price.

7.5 Where the option to return secondary wastes to the Customer has been selected, transportation of secondary wastes to the Customer shall be by Cyclife unless by prior agreement.

7.6 In such case, Cyclife shall also be responsible for preparation of all documentation, and receipt of all approvals, relating to the return shipment to the Customer unless otherwise stated within the Contract.

8 DELIVERY

8.1 Forms 247 and 249 include the following information to be provided by the Customer in regard to wastes to be delivered to Cyclife for processing:

- Consigner name and address
- Contact persons and contact details
- Date for consignment
- Estimated date of arrival at Cyclife facility
- Shipping Company
- Shipping route
- Estimated weight of consignment (kg)
- Number and type of packages
- Type of ISO container(s) to be used (if applicable)
- Provider of ISO container(s)
- Is the container end or top opening
- Are the container(s) equipped with fork lift tunnels
- UN Number (from ADR / RID)
- Type of materials
- Dominating nuclides
• Total activity of α, β and γ
• Dose rates of the packages: surface (D0), 1 m (D1)
• Dominating nuclides of α, β and γ
• Degree of enrichment for uranium contaminated waste
• If the waste contains any safeguarded material
• Type of waste packages (drums, bags, boxes etc.)
• Any specific requirements for secondary waste packaging
• If immediate return of the container(s) is required
• Desired UN number of the container to be returned
• Request for free release measurements of the container

8.2 Packaging of waste for delivery to Cyclife:

8.2.1 Correct packaging of Wastes for delivery to Cyclife forms part of the Waste Acceptance Criteria. Packaging can be provided by the Customer or by Cyclife as part of the agreed service.

Packaging shall be as follows:

(a) Dry active waste packages can be put into drums, Customer specific transport packages or directly into ISO transport containers. Cyclife can accept wastes packaged within full height, half height or third height ISO containers.

(b) The packaging and transportation of large components which are not packaged in ISO containers must be agreed in advance with Cyclife.

(c) All loading and restraining should be in accordance with the relevant transport regulations. Acceptable sub-packaging includes metal boxes, crates, drums or plastic wrapping. Please note that plastic wrapping will be returned to the customer as secondary waste.

(d) Packaging and loading must be reviewed by Cyclife prior to dispatch to enable the safe and efficient unloading at the facility. In order to be able to do this drawings and photographs shall be provided by the consignor to Cyclife.

8.2.2 Consignments not packaged in accordance with the above requirements shall be returned to the Customer at his expense unless Cyclife’s prior agreement has been obtained.

8.2.3 Return of packaging materials

Packaging materials will normally be collected by the Customer as contaminated packaging.

Otherwise it may be disposed of by Cyclife by compaction, melting or incineration, if suitable, at the Customer’s expense. If secondary waste is to be returned to the Customer, the packaging may be returned as packaging for the secondary waste, if suitable.