

waste – can you handle it?

Requirements for the sampling and testing of wastes destined for landfill

A guide for waste producers and waste managers

Introduction

The Landfill Directive will help the UK reduce its reliance on landfill and ensure wastes destined for landfill are treated to reduce their environmental impact. The Directive is implemented in England and Wales by the Landfill (England and Wales) Regulations 2002 (as amended) and the Pollution Prevention and Control (England and Wales) Regulations 2000 (as amended) – collectively referred to in this guidance as ‘the Regulations’.

The Regulations affect the types of waste that can be accepted in landfills.

- Certain kinds of waste cannot be landfilled.
- Landfills are classified according to whether they can accept hazardous, non-hazardous or inert wastes.
- Wastes can only be accepted at a landfill if they meet the waste acceptance criteria (WAC) for that class of landfill.
- Most wastes must be treated before they can be landfilled.

In addition, wastes must be subject to a hierarchy of characterisation and checking before they are accepted.

We have produced a summary of the requirements¹, as well as detailed guidance on waste acceptance² and on sampling and testing³.

This additional guidance is intended for waste producers and waste managers. It provides an introduction to the sampling and testing requirements and suggests sources of more detailed information.

Status

This guidance is based on information contained in the Regulations and on our current understanding of the law. It has been developed from a series of Environment Agency guidance documents that have been subject to extensive external consultation. The content of this document may be subject to change in the light of regulatory changes, future Government guidance or experience of applying the Regulations.

It remains the responsibility of waste producers and landfill operators to comply with any obligations placed upon them by the Regulations.

Waste acceptance criteria and procedures

The Directive's approach is not just to set out standards for landfill operation and construction, but also to make the behaviour of landfills more predictable by requirements aimed at obtaining a greater understanding of waste characteristics both before and following deposit.

In order to implement the Directive's requirements, the Regulations provide waste acceptance criteria (WAC) and waste acceptance procedures (WAP).

The WAC, which primarily aim to protect groundwater, were obtained by running computer models of landfills. The modelling was developed in Europe and reflects how leaching is likely to occur with the passage of water through a landfill with time.

There are three kinds of WAC:

- lists of acceptable wastes (which do not have to be tested);
- numerical leaching limit values;
- numerical limit values for other parameters.

These are discussed later in this document.

The WAP consist of a three level hierarchy of assessment of the waste.

- Level 1 (Basic characterisation): a thorough determination of the short-term and long-term leaching behaviour and/or characteristic properties of the waste.
- Level 2 (compliance testing): periodic testing using simple methods to ensure the waste is as predicted by level 1 testing.
- Level 3 (on-site verification): rapid checks on-site to confirm the waste is the same as that previously subjected to compliance testing and is as described in the accompanying documents.

Basic characterisation requires the following information:

- (a) Source and origin of the waste.
- (b) The process producing the waste (including a description of the process, its SIC code, and characteristics of its raw materials and products).
- (c) The waste treatment applied in compliance with Regulation 10, or a statement of reasons why such treatment is not considered necessary.
- (d) The composition of the waste, including where relevant, an assessment of it against the relevant limit values [in the Regulations] and, where necessary and available, its other characteristic properties.
- (e) The appearance of the waste (including its smell, colour, consistency and physical form).
- (f) The code applicable to the waste under the [European Waste Catalogue].
- (g) In the case of hazardous waste the relevant properties which render it hazardous according to [Annex III of the Hazardous Waste Directive].

- (h) A demonstration that the waste is not prohibited under Regulation 9.
- (i) The landfill class at which the waste may be accepted
- (j) The likely behaviour (including, where relevant, leaching behaviour) of the waste in a landfill and any additional precautions to be taken at the landfill.
- (k) Whether the waste can be recycled or recovered.
- (l) Identification of the key variables for compliance testing and options for simplification of compliance testing.

Is testing necessary?

It is likely that testing will be required to determine if a waste is hazardous or not, and to confirm the criterion/criteria that make it hazardous.

The Regulations do not require testing if:

- The waste is listed as not requiring testing. The Regulations currently list in this category certain wastes that are presumed to be inert, non-hazardous municipal waste, separated non-hazardous fractions of household waste and those same materials from other sources (i.e. paper, plastic, green waste, etc.).
- All the necessary information to characterise the waste fully is already known. This will usually only apply to wastes that are generated regularly by the same process in the same installation, and which have been previously tested or otherwise investigated such that the data already exist. For example, the producer or previous holder(s) may have tested the waste.
- Testing is impractical or appropriate testing procedures are not available. Although the Regulations make this provision, we have not yet come across wastes to which this applies. It would still be necessary to have sufficient information about the waste to be confident that it meets the relevant criteria for the class of landfill and any site-specific requirements.

You will be able to obtain many of the information requirements (a) – (l) listed above by checking rather than testing. In addition, a lot of the information will often already be known. However, an exception may be item (d) – the composition of the waste and assessment against the limit values.

Most previous testing in the UK has involved either analysis for total composition or leaching tests that did not use the tests specified in the Regulations. Therefore, apart from ‘listed wastes’, some testing using the prescribed tests will be necessary in most cases. In some cases, however, knowledge of total composition (either through testing or a detailed knowledge of process inputs) may indicate that leachable concentrations cannot exceed the WAC.

How much testing is necessary?

Basic characterisation will determine both how variable a waste is and the key parameters of possible concern. This information will decide the frequency and scope of compliance testing.

The Regulations distinguish between wastes that are generated regularly in the same process and wastes that are not. We consider there will be a spectrum of waste types from regular arisings of constant composition to one-off wastes. The ‘constant’ wastes will require less frequent characterisation and more frequent compliance testing. However, the ‘one-offs’ will effectively require basic characterisation each time they arise and little compliance testing. In between these extremes might be wastes generated regularly but from very variable processes, or wastes that are generated infrequently but have a standard composition. The frequency of compliance testing required is likely to depend, amongst other things, on whether every occurrence of the waste has been sampled for characterisation. The same process might be used in different facilities, but generate the same waste, whose characteristics are known. The Regulations provide for this situation: if wastes from a number of facilities have been characterised and the variability and their key variables shown to be the same, then the same wastes from other facilities may be accepted as characterised and a compliance regime can be set for individual facilities. Trade associations are likely to have important role in implementing this option in practice.

Responsibilities

Basic characterisation is the responsibility of the waste producer. This may be anyone whose activities produce waste ('original/primary producer') or anyone who subsequently undertakes operations resulting in a change in the nature or composition of this waste ('secondary producer'). However, it is the producer who consigns the waste to landfill who is responsible for basic characterisation. Because of the treatment requirement, the person consigning the waste to landfill is more likely to be the secondary producer. They will require information from the original producer to decide upon the treatment required and on the characterisation of the variability of the consigned waste.

Compliance checking and on-site verification are generally the responsibility of the landfill operator. The landfill operator will need to liaise with the producer, as the approach relies on the information from basic characterisation.

The leaching tests

The Regulations detail the test methods to be used for the limit values.

Granular wastes

For granular wastes, the tests involve shaking a prepared sample of the waste with water (leachant). A number of such 'batch' leaching tests are cited, which are carried out at different ratios of the waste (solid) to the leachant used in the test, i.e. liquid to solid (L/S) ratio. The limit values are then stated by reference to the test, for example, L/S 10 means 10 litres of leachant per dry kilogram of waste.

The Regulations list three such tests:

- BS EN 12457/1 – single step L/S 2 test
- BS EN 12457/2 – single step L/S 10 test
- BS EN 12457/3 – two-step L/S 2 plus L/S 8 test, for which the results are aggregated to provide L/S 10 information.

The Regulations use L/S 10 values. Although there is a L/S 10 test, we require use of the two-part test, BS EN 12457/3, because it provides more information about the leaching behaviour of the waste over time. In some circumstances, however, this may not be possible; more details are provided in our full guidance on sampling and testing.

Monolithic wastes

For monolithic wastes (i.e. non-granular wastes), the 64-day tank test, NEN 7345, is prescribed for characterisation. This involves suspending a block of the waste of specified dimensions in a tank of leachant. The leaching of constituents is a function of the surface area of a monolith, and the results are specified as milligrams per square metre. It is necessary to carry out this test:

- on the products of the treatment process producing the waste;
- at commissioning
- whenever the process or input changes sufficiently to influence the character of the product.

The relevant compliance test is a shortened version of the same test.

The leaching WAC for granular and monolithic wastes cannot be compared directly. However, they have been developed to provide the same level of protection for the environment.

Other leaching tests

Other tests, which are listed in the Regulations and in our full guidance, can provide more information about the behaviour of the waste. We expect these to be used to:

- assess the risk posed by the landfill;
- gain an understanding of how the wastes will behave in the landfill and how they will react with other wastes deposited with them.

Other criteria

As well as the leaching values, wastes also have to comply with other criteria.

Because the Regulations do not require inert landfills to be capped, criteria have been set for some additional parameters that might cause harm to human health or the environment. These are:

- PAHs (polycyclic aromatic hydrocarbons);
- BTEX compounds (benzene, toluene, ethylbenzene and xylenes);
- PCBs (polychlorinated biphenyls);
- mineral oil.

The Regulations also provide limit values for loss on ignition (LOI) or, alternatively, total organic carbon (TOC). This allows control on the gross amount of organic matter in the waste. The reasons are different for different waste types and are given below.

- For inert wastes, it assists in interpreting the requirements that such waste must not burn or biodegrade.
- For stable, non-reactive hazardous wastes (SNRHW) (see our other guidance documents), it assists in determining whether the waste is stable and non-reactive.

These limits on organic content are likely to have a major influence on the waste treatment selected for wastes.

SNRHW must be physically as well as chemically stable. We are also concerned that wastes in hazardous landfills must be physically stable. This is because, under the new requirements laid down by the Landfill Directive, they are likely to be mainly fine-grained inorganic wastes such as ash and filter cake. Limit values have therefore been set for load bearing capacity of:

- 50 kPa for granular hazardous wastes and granular SNRHW;
- 1.5 MPa for monolithic hazardous waste and monolithic SNRHW.

Sampling

Because wastes may be variable and heterogeneous, sampling is important. The collection of the sample will depend upon how the waste is produced by the process and how it is stored (e.g. skip, stockpile, hopper, etc.). The Regulations therefore require the preparation of a sampling plan in accordance with the European standard prEN 14899.

The key steps in preparing the plan are:

- Define the overall objectives – identify and consult with interested parties, and consider health and safety issues.
- Determine the level of investigation – Level 1, 2 or 3.
- Determine the parameters of interest.
- Research background information – location, process, etc.
- Define methodology – population, sample numbers, pattern, size and reliability of outcome.
- Identify the most appropriate technique from the standard on sampling (prEN 14899).
- Document and implement the plan.

Guidance on each of these steps is given in the standard. Further information is given in our detailed guidance.

Where to look for more detailed guidance

Our guidance

An overview of the waste acceptance requirements is given in:

- Requirements for waste destined for disposal in landfill: a guide for waste producers and waste managers.

More detailed guidance is given in:

- Requirements for the acceptance of waste in landfill.
- Guidance on sampling and testing of wastes to meet landfill waste acceptance procedures.

The contents of these two documents are set out in Table 1

To request copies and find out more call us on 08708 506 506 or visit our website: www.environment-agency.gov.uk/newrulesonwaste

Other sources of useful information

- **Department for Environment, Food and Rural Affairs (Defra)** (www.defra.gov.uk/environment/waste/index.htm) – this Government website provides information about various waste topics related to the implementation of legislation. Includes the Government’s interpretation of the Landfill (England and Wales) Regulations 2002 (as amended) published by Defra in September 2004.
- **Envirowise** (www.envirowise.gov.uk) – a Government-funded programme providing free advice and support to businesses on how to increase profits by minimising waste and reducing environmental impact.
- **Environmental Services Association** (www.esauk.org) – a trade body of the UK’s waste management industry.
- **Chartered Institution of Wastes Management** (www.iwm.co.uk) – the UK professional body for waste managers.
- **Waste and Resources Action Programme** (www.wrap.org.uk) – a UK initiative aimed at removing barriers to waste minimisation, reuse and recycling.
- **Waste Management Industry and Training Board** (www.wamitab.org.uk) – an independent body, which works with industry and for the industry on education and training issues.

Table 1: Where to find information in our detailed guidance

Requirements for the acceptance of waste in landfill	Guidance on sampling and testing of wastes to meet landfill waste acceptance procedures
Timetable for introducing the requirements	Approach to information gathering and the relationship between the producer and landfill operator.
Prohibited wastes (definitions and interpretation)	Guidance for the primary waste producer – sampling, testing, interpretation and reporting
Overview of landfill classification and waste acceptance requirements	Additional considerations for secondary waste producers ie treatment and transfer of wastes
Requirements for inert landfills	Guidance for the landfill operator. In particular, this sets out how we intend to interpret the data to assess compliance.
Requirements for non-hazardous landfills	The European standard on sampling of wastes
Requirements for hazardous landfills	The background to sampling programme design
Special provisions for stable, non-reactive hazardous wastes; asbestos; gypsum and other high sulphate wastes; underground storage	A description of the test methods and the interpretation of the results
Issues for which site specific risk assessment will still be relevant	A comparison of the compliance scheme with the approach to regulation of effluent discharges
Explanation of the three level hierarchy of waste testing and its application to wastes arising in different ways	
Interpretation of the requirements to treat waste before it is landfilled (with examples in an annex)	
The wider factors in the process of selecting a waste management option	

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Notes