

**Waste classification
guidelines
Part 2: Immobilisation of
waste**



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Introduction

Certain wastes have properties that make them hazardous and potentially harmful to human health or the environment. New South Wales has established a stringent regulatory regime for managing harmful wastes at their source, during transport and when they are treated or disposed of.

As a first measure, industries generating waste must classify the waste in order to assess its properties and determine appropriate avenues for handling, transporting and disposing of it. Waste is classified in accordance with the *Protection of the Environment Operations Act 1997* and as outlined in 'Part 1: Classifying waste' in these *Waste Classification Guidelines* (also known as the 'Waste Guidelines'). These are available from the EPA Environment Protection Authority (EPA) website at www.epa.nsw.gov.au/waste/classification.htm.

Waste classified as 'hazardous' in accordance with the Waste Guidelines or otherwise exhibit properties harmful to human health and/or the environment because of the high levels of contaminant(s) it contains is not suitable for disposal to landfill in NSW.

However, sometimes the contaminants are able to be 'immobilised' so that they will not be released into the landfill leachate at levels of concern. In these cases, EPA may grant an immobilisation approval. Immobilisation of a contaminant in waste is a measure of how securely that contaminant is fixed or locked-up in the waste for the long term. EPA issues immobilisation approvals in accordance with clause 50 of the Protection of the Environment Operations (Waste) Regulation 2005. The approval granted under this clause may be a 'general immobilisation approval' (GIA) or a 'specific immobilisation approval' (SIA).

An immobilisation approval enables a waste to be reassessed and reclassified. Conformity with an immobilisation approval would enable a waste to be disposed of at a landfill appropriate to its reclassification.

Immobilisation Approvals are applicable to **non-liquid waste only**. The non-liquid criteria contained in Step 3 of Part 1 of the *Waste Classification Guidelines* applies to:

- a naturally immobilised waste that is subject to a GIA,
- a natural immobilised waste that is subject to a SIA or
- a non-naturally immobilised waste that is required to be treated under a SIA,

In granting an immobilisation approval for a given waste, the EPA may attach special conditions and/or disposal restrictions to the Approval in accordance with the hazardous and/or toxic properties of the waste.

Who should use this guide?

This guide should be used by waste generators and treatment facilities who:

- classify their waste as hazardous under the Waste Guidelines because of its high levels of contaminants
- establish that it is not possible to reuse, recycle or reprocess the waste by specific treatment to remove or destroy the contaminants
- need to dispose of the waste
- establish that the contaminants of concern can be immobilised so that they will not be released into landfill leachate at levels of concern.

How to use this guide

This guide provides an overview of the immobilisation of contaminants in waste and explains how to receive EPA approval to enable legal disposal of immobilised waste to landfill.

It also explains the two types of immobilisation approvals issued by EPA, and the assessment process that supports immobilisation approvals.

Applicants for a specific immobilisation approval should read these guidelines before downloading the application form available at:

www.epa.nsw.gov.au/waste/ApplyforSpecificImmobilApp.htm. The application form provides more detail in Section B on information that needs to be provided to EPA in an application.

How is immobilisation achieved?

There are several ways to immobilise contaminants in waste:

- **Natural immobilisation** where the contaminant(s) are already present in an immobilised form and the waste is suitable for landfilling without additional treatment
- **Chemical fixation** where the contaminant(s) are chemically converted to a stable form
- **Micro-encapsulation** where the waste is treated to physically lock up the contaminant(s) in the structure of the treated waste
- **Macro-encapsulation** where an enduring physical barrier is placed between the contaminated waste and the surrounding landfill environment.

Treatment of waste

A waste may be subject to suitable treatment and processing to achieve fixing of the contaminants of concern. The waste treatment process plant and equipment to be used for the purposes of achieving immobilisation of contaminants in waste must be technologically safe and sound. Where mixing of chemical reagents during treatment, it must meet the EPA's mixing policy as described in the Technical Notes

www.epa.nsw.gov.au/waste/technicalnotesimmobilisation.htm.

Prior to disposal off site, check that the subject waste has no free liquids meeting of the following Non-Liquid Criteria:

- it has an angle of repose greater than of 15 degrees (15°), see attached reference
- it has no free liquids when tested in accordance with the USEPA Paint Filter Liquid Test – Method 9095 (USEPA 1986), and
- it liberates no free liquids when transported.

Dilution without achieving the immobilisation of contaminants is **NOT** an acceptable waste treatment option.

Immobilisation approvals

Immobilisation approvals may specify conditions relating to the subsequent storage, treatment or disposal of the waste. The two types of immobilisation approvals issued by EPA are discussed below to provide the waste generator with a clear understanding of how the immobilisation approval will be issued by EPA.

General immobilisation

EPA has published a number of general immobilisation approvals on its website. These approvals are for commonly generated hazardous wastes. EPA has assessed these commonly generated hazardous wastes as either being naturally immobilised or able to be immobilised using well-established treatment technology. Setting up general immobilisation approvals helps to streamline the disposal process for these commonly generated wastes.

General immobilisation approvals specify:

- the waste to which the approval applies
- for waste that is not naturally immobilised, the treatment required to immobilise the waste
- any other conditions, such as testing, record keeping and waste tracking, which are required
- how waste subject to the approval may be classified for disposal.

Generally, a person who generates waste that has the same properties described in a general immobilisation approval does not have to apply to EPA to dispose of this waste. It should be noted however that some general immobilisation approvals might require the generator to advise EPA if they intend to dispose of waste. A generator should check the details within the approval. A list of general immobilisation approvals is published on the EPA website at www.epa.nsw.gov.au/waste/genimmobilisationapp.htm.

Specific immobilisation

Where no general immobilisation approval exists, EPA may issue a specific immobilisation approval for a certain hazardous waste. The person generating the waste would need to apply to EPA for a specific immobilisation approval and comply with the conditions in that approval before this waste could be disposed of to landfill. Applicants should follow the 'specific immobilisation approval' application process outlined in the following section.

Applying for a specific immobilisation approval

Things to check before you apply to EPA

Before applying for a specific immobilisation approval:

1. Ensure that the waste has no free liquids and you have characterised the waste through assessment and testing as required under the Waste Guidelines, identifying contaminants of concern and their variability. Immobilisation is only necessary where waste is classified under the Waste Guidelines as 'hazardous' or 'restricted solid waste'.
2. Investigate alternatives to immobilisation. Specific immobilisation approvals will only be issued where it is not practical to reuse, recycle or reprocess the waste. Where feasible, treatment to remove or destroy the contaminants is preferable to immobilisation.

3. Check the EPA website to see whether there is a general immobilisation approval for your waste already granted by EPA at:
www.epa.nsw.gov.au/waste/genimmobilisationapp.htm.

Important note: A general immobilisation approval will only be applicable if the waste is the same as that described in the approval, including any restrictions, such as its method of formation, and the contaminants listed in the approval include all the contaminants of concern in the waste. Also, if the waste is not covered by, but is similar to, a waste covered by a general immobilisation approval, contact EPA as it may be possible to submit an abridged application based on the general immobilisation approval.

Information to be provided as part of an application

Ensure that you have followed the above checklist before downloading the application form at: www.epa.nsw.gov.au/waste/ApplyforSpecificImmobApp.htm. The application may take longer to process if EPA has to go back to the applicant for additional information before it can complete its assessment. The application form includes details of where to send the form and the fee payable to EPA.

Section A of the application form asks for general information such as the applicant's contact details (ABN number for a corporate entity) and, where applicable, licensee details; where the waste is stored; and the proposed disposal facility the waste will be sent to.

Section B of the application form asks the applicant to address the proposed treatment and immobilisation mechanism in the form of a report. Information to be provided includes evidence that it is not possible to reprocess the waste in order to reuse or recycle it. Details on quantity, form, background information and chemical composition of the waste should be provided. The applicant should also describe the proposed treatment methods or process, if applicable, to be used, the equipment to be used and evidence of quality assurance/quality control.

Applicants will need to provide details about 'treatability', including total concentration of the contaminants and the leaching performance based on 'toxicity characteristics leaching procedure' (TCLP) tests or other relevant tests. It should be noted, however, that TCLP results alone are not generally accepted as proof of immobilisation. The scientific basis and relevant reaction chemistry for claiming immobilisation must also be included in an application for a specific immobilisation approval. Where appropriate conduct additional leaching test such as the USEPA Multiple Extraction Procedure Test Method 1320 (MEP Test) to demonstrate long term leaching performance of the contaminants of concern.

Where the waste is not naturally immobilised or is being macro-encapsulated, it may be necessary to undertake treatment trials to determine the effectiveness of the proposed treatment. Attention should be paid to addressing scale-up issues between laboratory trials and the actual treatment. Laboratory trials, for example, often do not reproduce the conditions needed to achieve effective mixing during full scale treatment. Refer to EPA's technical note on mixing for more information available at:
www.epa.nsw.gov.au/waste/technicalnotesimmobilisation.htm.

The most important part of Section B is providing scientific justification for the proposed immobilisation method or process. More information on proving scientific justification is provided in the following section.

Additional information to support an application should also be attached to an application. This additional information may include test results and articles from reputable scientific journals that support the successful immobilisation of contaminants.

Providing scientific justification to EPA

Section B of a specific immobilisation approval application asks the applicant to explain the scientific basis that underpins the process by which immobilisation of contaminants in waste will be achieved. This is the most important part of the report and should include a summary of the following as relevant:

1. Demonstrate the means by which the contaminants of concern are immobilised (including formation of chemical compounds during treatment which are claimed to result in the immobilisation of some or all of the contaminants):
 - for natural immobilisation, identify the chemical compounds of the contaminants of concern present in the waste
 - for chemical fixation, identify the chemical reactions which convert the contaminants of concern into an immobilised form
 - for micro-encapsulation, identify the mechanism by which the contaminants of concern are micro-encapsulated and provide supporting Unconfined Compression Strength (UCS) test data as appropriate (See EPA Technical Notes 'Cement Fixation of Organic Chemicals in Waste'
<http://www.epa.nsw.gov.au/waste/technicalnotesimmobilisation.htm>.)
 - for macro-encapsulation, describe the nature of the physical barrier to be established between the waste and the surrounding landfill environment.
2. Demonstrate that the means by which the contaminants are immobilised will be maintained over time in the landfill environment.
3. For chemical fixation or micro-encapsulation, confirm that any other substances present in the waste will not interfere with the chemical fixation or micro-encapsulation, as well as that any untreated reagent will not present an environmental problem.
4. For macro-encapsulation, demonstrate that no other form of immobilisation is viable.
5. Confirm, with TCLP results, that the contaminants of concern are immobilised in the waste to be landfilled (not necessary for macro-encapsulation). In some cases, multiple extraction procedure (MEP Test) results will also be required to demonstrate long-term stability in the landfill environment.