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Hazardous waste

Interpretation of the definition and classification of hazardous waste
(Second Edition, version 2.2)

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Statement of Use

This Technical Guidance on hazardous waste has a similar purpose to WM1 Special Wastes: A technical guidance note on their definition and classification. This document defines hazardous waste for regimes that refer to hazardous waste. WM1 will continue to be used to provide guidance on the assessment of waste according to the criteria contained in the Special Waste Regulations as appropriate in England, Wales, Scotland and Northern Ireland.

It is intended as a reference document for use by the waste management industry, producers, and regulators of hazardous waste. This Technical Guidance has been produced by the Environment Agency, SEPA and the Environment and Heritage Service. In this document, they are known collectively as "the Agencies".

A consultation document was released externally by the Agencies in September 2002 and amendments made to the to version 1.0. The Second Edition updated this document, version 2.1 implements Approved Supply List changes.

Keywords

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List of Abbreviations

ASL	Approved Supply List (current edition)	LC	Lethal concentration
ASTM	American Society for Testing and Materials	LD	Lethal dose
ATSDR	Agency for Toxic Substances and Disease Registry	LEL	Lower Explosive Limits
BCF	bioconcentration factor	MEC	Minimum effective concentration
BOD	biological oxygen demand	MECA	Minimum effective concentration in adult
BSI	British Standards Institute	MECD	Minimum effective concentration in developing embryos
CAS	Chemical Abstract Service	MFSU	Manufacture, formulation, supply and use
CD-ROM	Compact Disk – Read Only Memory	MSDS	Material Safety Data Sheets
CDS	Chemical Detection System	NCEC	National Chemical Emergency Centre
CFC	chlorofluorocarbon	NFPA	National Fire Protection Association
CHIP3	Chemicals (Hazards Information and Packaging) [Regulations]	NIOSH	National Institute of Safety and Health
CIS	Chemical Information System	OHMTADS	Oil and Hazardous Materials Technical Assistance Data Systems
DIN	Deutsche Industrie Normen	PAH	polycyclic aromatic hydrocarbon
DOSE	The Dictionary of Substances and their Effects	PCBs	polychlorinated biphenyls
DPD	Dangerous Preparation Directive	PCTs	polychlorinated terphenyls
EC	European Communities	PETN	pentaerythritol tetranitrate
ECB	European Chemicals Bureau	RDX	cyclotrimethylene trinitramine
EEC	European Economic Community	RTECS	Registry of Toxic Effects of Chemical Substances
EHC	Environmental Health Criteria	SCA	Standing Committee of Analysts
EINECS	European Inventory of Existing Commercial Chemical Substances	SDSs	Safety Data Sheet(s)
EU	European Union	SEPA	Scottish Environment Protection Agency
EWC 1994	European Waste Catalogue 1994	SIRI MSDS	Safety Information Resources and Material Safety Data Sheets
EWC 2002	Revised European Waste Catalogue 2002	STP	Standard temperature and pressure (25°C, 1 atmosphere pressure)
FGT	Flue Gas Treatment	TER	transcutaneous Electrical Resistance
HSC	Health and Safety Commission	TGBE	triethylene glycol mono-N-Butyl ether
HSDB	Hazardous Substances Data Bank	TGME	triethylene glycol monomethyl ether
HSE	Health and Safety Executive	TSCA	Toxic Substances Control Act
HWD	Hazardous Waste Directive	UEL	Upper Explosive Limits
HWL	Hazardous Waste List	UK	United Kingdom
IARC	International Agency for Research on Cancer	UKEMS	UK Environmental Mutagen Society
IPCS INCHEM	International Programme on Chemical Safety	URL	Uniform Resource Locator
IRIS	Integrated Risk Information System	USA	United States of America
ISCS	International Chemical Safety Cards	USEPA	United States Environmental Protection Agency
ISO	International Standards Organisation	WAF	Water-accomodated Fraction
IUCLID	International Uniform Chemical Information Database	WHO	World Health Organisation
L/S	Liquid to Solid	XPS	Extruded Polystyrene

Introduction

This Technical Guidance document has been developed to provide guidance on the assessment and classification of hazardous waste based on the Hazardous Waste Directive^a definition of hazardous waste.

It is intended to provide guidance to all involved in the production, management and control of hazardous waste and to be a reference document for all legislation related to hazardous waste and its management.

The guidance is structured as follows:

Chapter 1	Introduction
Chapter 2	Regulatory Framework, setting out the legal framework for the definition of hazardous waste
Chapter 3	Hazardous Waste Assessment Framework, outlines the methodology for assessing wastes based on the EWC
Appendix A	European Waste Catalogue, provides guidance on the use of the catalogue
Appendix B	Absolute and Mirror Entries, provides guidance on the potential hazards associated with different hazardous wastes
Appendix C	Hazardous Property Assessment, providing guidance on the assessment of each hazardous property
Appendix D	Data Sources, providing users with information on data sources and origin of the information from different sources

^a Council Directive 91/689/EC

Regulatory Framework

This chapter sets out:

- the legal framework for the definition of hazardous waste as defined by the Hazardous Waste Directive; and
- how the definition is derived and how it is linked to EU legislation.

2.1 Hazardous Waste Directive (HWD, Council Directive 91/689/EC)

The aim of the HWD is to provide a precise and uniform European-wide definition of hazardous waste and to ensure the correct management and regulation of such waste. The starting point of the HWD is to identify which wastes are deemed to be hazardous.

Article 1(4) of the HWD defines hazardous waste as wastes featuring on a list drawn up by the European Commission, because they possess one or more of the hazardous properties set out in the HWD. There are 14 hazardous properties set out in Annex III of the HWD and they are detailed in Table 2.1.

In 1994 a comprehensive list of all wastes, hazardous or otherwise, was produced pursuant to Council Directive 75/442/EEC (as amended by 91/156/EEC). This list is known as the European Waste Catalogue (EWC 1994, Commission Decision 94/3/EC).

Council Decision 94/904/EC then identified which of the wastes on EWC 1994 are deemed to be hazardous, based on the properties set out in the HWD. The resulting list of wastes was called the Hazardous Waste List (HWL) and was the list defining hazardous waste required by Article 1(4) of the HWD.

The EWC is subject to periodic review in accordance with Article 1(4), second indent. After several years of debate among the EC countries the EWC 1994 and HWL were updated and combined. This resulted in a revised European Waste Catalogue (EWC 2002, Commission Decision 2000/532/EC). 2000/532/EC was subsequently amended by Commission Decisions 2001/118/EC, 2001/119/EC and Council Decision 2001/573/EC.

2.2 Revised European Waste Catalogue (EWC 2002)

The EWC 2002 is intended to be a catalogue of all wastes, grouped according to generic industry, process or waste type.

The EWC 2002 differentiates between non-hazardous and hazardous by identifying hazardous waste entries with an asterisk (*).

Details of how to use the EWC 2002 and the steps that should be followed to identify a waste in the catalogue and whether that waste is hazardous are given in Commission Decision 2001/118/EC. A Hazardous Waste Assessment Framework is set out in Chapter 3, which outlines the methodology for assessing wastes based on the EWC 2002.

A consolidated version of the EWC 2002 (incorporating Commission Decision 2000/532/EC and its subsequent amendments) and a description of how to use the catalogue are set out in Appendix A.

2.2.1 Links to other legislation

The EWC 2002 links the classification of certain hazardous waste to the concentrations of “dangerous substances” within the waste. It defines “dangerous substances” as substances classified as dangerous in Directive 67/548/EEC and its subsequent amendments.

Directive 67/548/EEC is the European Council Directive on Dangerous Substances that specifies the hazard classification, packaging and labelling requirements for dangerous substances supplied in the European Union.

In addition, the EWC 2002 derives threshold concentrations for certain hazardous properties from the Directive 88/379/EEC, the European Council Directive on Dangerous Preparations, and its subsequent amendments. Directive 88/379/EEC specifies the hazard classification, packaging and labelling requirements for dangerous preparations supplied in the European Union.

The requirements of Directive 67/548/EEC and Directive 88/379/EEC are implemented in the UK through the Chemicals (Hazard Information and Packaging for Supply) Regulations 2002^b, which are known as CHIP3. Details of how CHIP3 relates to the classification of hazardous waste are set out in the Hazardous Waste Assessment Framework in Chapter 3 .

Where hazardous waste is to be transported it also needs to be classified in accordance with the requirements of Directives 94/55/EC and 96/49/EC regarding the transport of dangerous goods by road and rail (respectively), and the regulations which implement them in the UK. Guidance on the transport of dangerous goods can be obtained from the Health and Safety Executive.

2.2.2 Domestic Legislation

The implementation of the Hazardous Waste Directive and the European Waste Catalogue in England , Northern Ireland, Scotland and Wales may differ. Further guidance on each regulatory regime is published by the Agencies on their respective websites.

This document provides the common technical basis for the definition of Hazardous Waste in the United Kingdom.

^b SI 2002 No. 1689, HMSO London, ISBN 0 11 042419 0

Table 2.1 | Hazardous Properties (Hazardous Waste Directive Annex III)¹

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.
H3A	<p>“Highly Flammable”</p> <ul style="list-style-type: none"> - liquid substances and preparations having a flashpoint of 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 source of ignition, or - gaseous substances and preparations which are flammable in air at normal pressure, or - substances and preparations which, in contact with water or damp air, evolve highly flammable gases in dangerous quantities.
H3B	“Flammable”: liquid substances and preparations having a flashpoint 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 micro-organisms or their toxins which are known or reliably believed to cause disease in man or other living organisms.
H10 ²	“Toxic for reproduction”: substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may produce or increase the incidence of non-heritable adverse effects in the progeny and/or of male or female reproductive functions or capacity.
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 of the 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.

¹See Appendix C for Hazardous Property Assessments.

²EWC 2002 states that “Toxic for reproduction” is considered to be in line with the hazardous property H10 “Teratogenic” in the HWD.

Hazardous Waste Assessment Framework

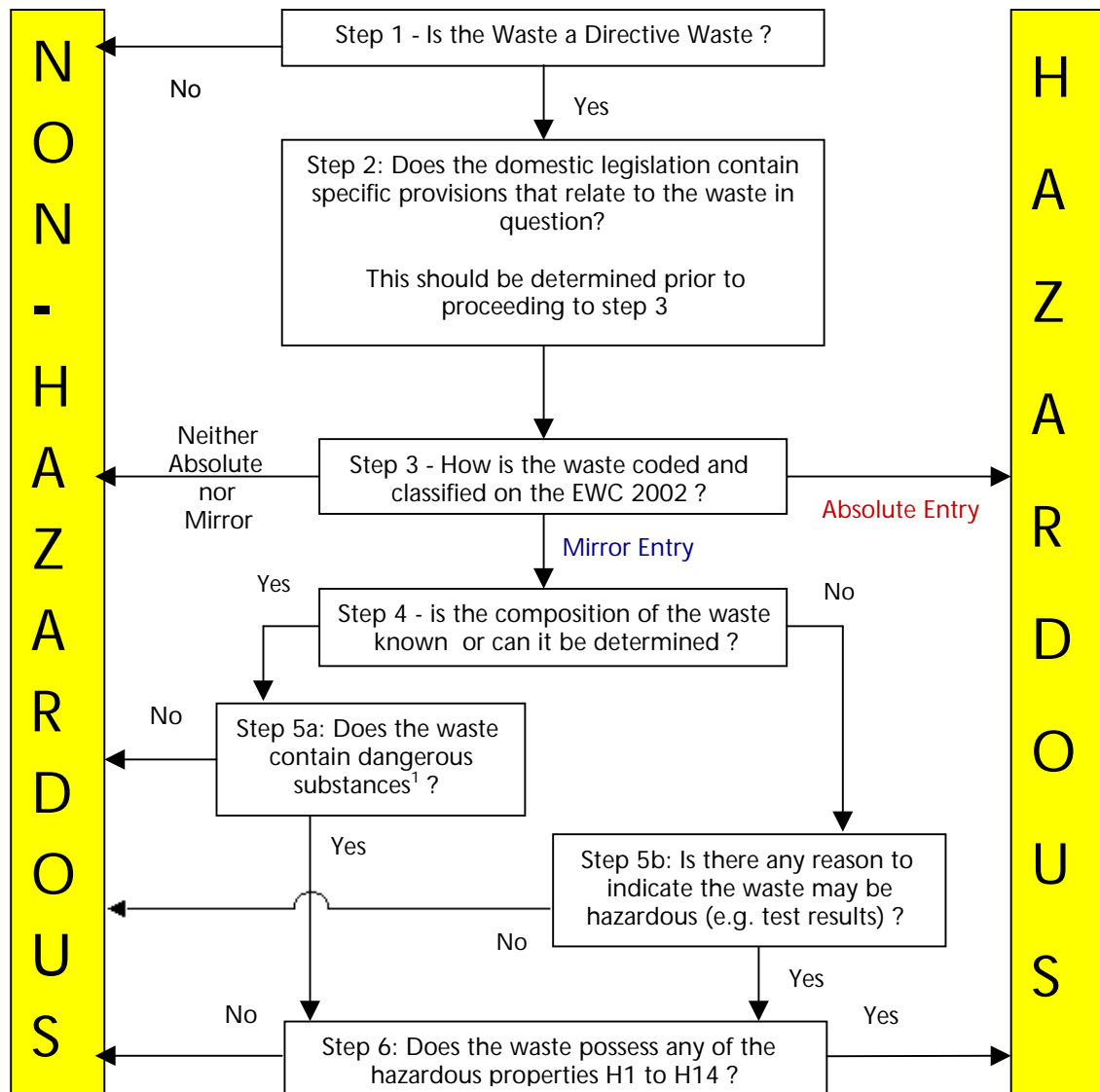
This chapter provides a practical approach to classifying hazardous waste by:

- outlining the methodology for assessing wastes based on the EWC 2002; and
- highlighting where to find more detailed advice in the Technical Guidance Note.

3.1 Hazardous Waste Assessment Methodology

There is a series of steps involved in determining if a waste is hazardous or non-hazardous. These steps are set out in a flowchart in Figure 3.1. The flowchart is cross-referenced to sections within the text that explain the issues underlying each decision and where to find more detailed advice in the Technical Guidance Note.

Figure 3.1 Hazardous Waste Assessment Methodology



Note:

¹ Infectious substances should be considered at this stage of the Hazardous Waste Assessment Methodology

3.1.1 Step 1: Is the waste Directive waste?

Directive waste means;

- (i) waste as defined in Article 1(a) of Council Directive 75/442/EEC on waste.
- (ii) ... is not excluded from the scope of that Directive by Article 2 of that Directive.

if waste is not Directive Waste, it is not hazardous waste .

3.1.2 Step 2: Does the domestic legislation contain specific provisions that relate to the waste in question?

This should be determined prior to proceeding to step 3

Notes on the Application of this guidance to specific waste streams:

- The timing of the implementation of regulatory controls to **agricultural waste** and **mine or quarry waste** differs in England, Northern Ireland, Wales and Scotland. Information on this is available from each of the Joint Agencies.
- Most **radioactive waste** is not Directive Waste, but comes under the Radioactive Substances Act 1993 (RSA). However, if radioactive waste is exempt from the requirements of sections 13 or 14 of the RSA, and has one or more of the hazardous properties, this waste will be classified as hazardous waste.
- **Domestic waste** is excluded from the requirements of the HWD. Guidance on what constitutes 'domestic waste', and how regulatory controls are applied to it, is available from each of the Joint Agencies .
- The Secretary of State (SoS), the Welsh Assembly, Scottish Executive or Northern Ireland Department of the Environment may determine in exceptional cases, that a specific batch of waste
 - displays one or more of the hazardous properties, and is therefore hazardous waste.
 - does not display any of the properties listed in Annex III to the Hazardous Waste Directive, and is therefore non-hazardous waste.

Waste will only be classified after the appropriate organisations have been consulted. We will publish any decisions made by the Secretary of State under section 62A(1) of the Environmental Protection Act 1990.

3.1.3 Step 3: How is the waste coded and classified on the EWC 2002?

The EWC 2002 details a series of steps for identifying wastes in the catalogue and the order in which entries in the catalogue must be considered. **The EWC 2002, and an explanation of how to use it, is set out in Appendix A.**

The EWC 2002 consists of 20 chapters that are related to the process that generated the waste or to specific waste types. The chapters are given a two-digit number. These chapters must be used in a certain order of precedence (see Appendix A).

Each Chapter contains sub-chapters that are identified by four-digits. Within each sub-chapter are a list of unique six digit codes for each waste e.g.

20 Municipal Wastes (Household waste and similar commercial, industrial and institutional wastes) Including separately collected fractions.

20 01 Separately collected fractions (except 15 01)

20 01 01 paper and cardboard

The EWC consists to three types of entry

"Absolute entries" : A number of wastes marked with an asterisk (*) are deemed to be hazardous regardless of their composition or concentration of any "dangerous substance" within the waste. Such entries have been termed " absolute entries" and are coloured **red** in this document for clarity.

"Mirror Entries" : Some wastes have the potential to be either hazardous or not, depending on whether they contain "dangerous substances" at or above certain thresholds. These wastes are covered by linked (usually paired) entries, collectively called "mirror entries" that comprise;

- a hazardous waste entry marked with an asterisk (*), coloured **blue** in this document, and
- an alternative non-hazardous waste entry (or entries) not marked with an asterisk.

“Non-Hazardous Entries”: Where a waste is not listed in the EWC 2002 with an asterisk, then it is not hazardous. However where the non-hazardous entry forms part of a “mirror entry” assessment is required to determine whether the hazardous or non-hazardous waste entry is applicable.

3.1.4 Step 4: Is the composition of the waste known or can it be determined?

One of the simplest methods of identifying whether a “mirror entry” waste is hazardous is to identify the chemical composition of the waste and then determine if the concentrations of the chemicals within the waste are sufficient to render the waste hazardous.

The composition of the waste could be identified using:

- knowledge of the process or activity that produced the waste; and/or
- chemical/microbiological analysis of the waste; and/or
- information on the Safety Data Sheets.

It should be noted that chemical analyses (particularly for inorganic substances) do not always identify the components within a waste, but the individual species such as anions (e.g. sulphate, chloride) and cations (e.g. metals). In such cases the waste holder would need to determine what substances are likely to be present based on the process/activity that produced the waste and the anions and cations present. If the holder cannot decide which substances might be present, they should assume the worst-case scenario for each component and assess the waste accordingly.

In the majority of cases the company producing or storing a “mirror” entry waste should have enough information about the chemical substances in their waste to know if it is hazardous or not (e.g. from safety data sheets, or knowing how the waste was produced).

If they do not know what substances are in their waste and they cannot find this out, they will need to test the waste (see Step 6b). This may not be appropriate for all hazardous properties (see Appendix C).

3.1.5 Step 5a: Does the waste contain “dangerous substances”?

Where the composition of a “mirror entry” waste is known, it can be assessed to determine if the waste contains “dangerous substances” or not. Chapter 2 highlights that the EWC 2002 defines “dangerous substance” using the European Council Directive on Dangerous Substances¹, which is implemented by CHIP3 in the UK.

There are three ways to find out if the substances in a “mirror” entry are dangerous:

1. use the Approved Supply List (ASL)². This shows hazard information and classification for many common chemicals³. If the waste contains substances on the ASL, this classification **must** be used. The ASL is updated regularly, the most recent version should be used.
2. use the methodology given in the Approved Guide to the Classification and Labelling of Substances and Preparations for Supply⁴ with data for the substance obtained from peer reviewed sources.
3. use information from the Safety Data Sheets or other data sources to find out whether the waste contains dangerous substances .

The classification of the substance(s) shows :

- the categories of danger exhibited by the substance; and
- the risk phrase(s), which describe the hazards the substance possesses.

If none of the substances in the waste are classified as “dangerous substances”, the waste will not be hazardous and the non-hazardous EWC code can be used.

¹ 67/548/EEC and amendments

² Approved Supply List (most recent edition) - Information approved for the classification and labelling of substances and preparations dangerous for supply. At the time of publication the current edition was the 8th, HSE Books, ISBN 0 7176 6138 5

³ Chemical is the common term for substances (a chemical element or one of its compounds, including any impurities) and preparations (a mixture of substances).

⁴ Approved Guide to the Classification and Labelling of Dangerous Substances and Dangerous Preparations (the Approved Classification and Labelling Guide) Fifth edition, HSE Books, ISBN 0 7176 2369 6

Using the ASL

The ASL prescribes hazard classifications for many common chemicals, and where a chemical is listed in the ASL the classification given therein takes precedence over a classification found elsewhere. (Note: The most recent edition of the ASL should always be used)

The ASL is split into five parts with classification information contained in Part I, which is an alphabetical listing of all the substances covered. An example of the classification of a chemical given in Part I to the ASL is set out in Box 3.1.

To aid identification, each ASL entry provides alternative chemical names and the Chemical Abstract Service (CAS) number. The CAS number is the most accurate identification of a substance that may have many non-standard names.

In some cases the ASL shows risk phrases joined together by comma (,) or an oblique stroke (/), to indicate how information should be presented on a label. For the purpose of assessing hazardous waste the comma and oblique stroke are interchangeable. A hyphen (-) is used to represent an 'and' in the case of Ecotoxic risk phrases, e.g. R50-R53 represents R50 and R53.

Box 3.1: Example of an entry from the ASL

Cadmium sulphide		
CAS	001306-23-6	
Index	048-010-00-4	The classification required for the assessment of hazardous wastes
Class'n	Carc Cat 2: R45 Muta Cat 3: R68 Repr Cat 3: R62, 63 T:R48/23/25 Xn: R22 R53	
Label	T R22, 40, 48/23/25 S(1/2), 22, 36/37, 45 215-147-8	Information that must be included on the supply label
Conc	Note 1 Conc >= 10% T: R22, 40, 48/23/25 Conc >= 1% and < 10% Xn: R22, 40, 48/23/25 Conc >= 0.1% and < 1% Xn: R48/23/25	Some substances have specific threshold concentration limits; they are not used when assessing hazardous wastes

The classification of cadmium sulphide is therefore Carc Cat 2: R45 Muta Cat 3: R68 Repr Cat 3 R62, 63 T:48/23/25 Xn: R22 R53

- Carc Cat 2 (Carcinogenic Category 2), Muta Cat 3 (Mutagenic Category 3), Repr Cat 3 (Toxic for Reproduction Category 3), T (Toxic) and Xn (Harmful) indicating the Categories of Danger or hazards; and
- R45, R68, R62,63, R48/23/25, R22 and R53 being the risk phrases.

A full description of all risk phrases is set out in Part V of the ASL with a summary in Table 3.1.

The ASL contains two series of notes.

- The alphabetic series (Note A, B, etc.) which appears after the substance name. These notes are only relevant to hazardous waste where they alter the classification of the chemical. The assessment of hazardous wastes is based upon the classification.
- The numeric series (Note 1, 2, etc.) which appears above the concentration limit information. As the concentration limits are not normally used when assessing hazardous waste, these notes should not be used for hazardous properties H1 and H3 to H13. They may be used for H2 and H14.

Approved Classification and Labelling Guide and Safety Data Sheets

The ASL only covers a small proportion of the substances on the European Inventory of Existing Commercial Chemical Substances (EINECS). If a substance is not listed in the ASL then further research is required to determine the substance classification. There are two options:

- Determine the classification using the criteria set out in the Approved Classification and Labelling Guide; or
- Use classification information from Safety Data Sheets

The **Approved Classification and Labelling Guide** provides information on:

- the type and sources of data that can be used, which include results of testing, information required by international rules on the transport of dangerous goods, reference works or scientific and technical literature and practical experience;
- the criteria for each category of danger; and
- how to assign risk phrases.

The criteria for the categories of danger specify the data or test method necessary to assign each category. The criteria for health effects are usually based on human or animal toxicological data with physico-chemical effects generally based on test results. The criteria also assign the appropriate risk phrase.

To classify a substance that is **not** on the ASL, the available data must be collected and compared against the criteria specified for each category of danger. If the data indicate a particular category of danger, the appropriate risk phrase should be assigned. It should be remembered that substances could have more than one category of danger and a number of risk phrases. Therefore the criteria for each category of danger should be considered in turn.

Appendix B provides an indication of the potential hazardous properties (i.e. category of danger) that different wastes may possess, to help the waste assessor identify which criteria to consider. The criteria relevant to the assessment of hazardous waste are set out in the individual hazard assessments in Appendix C.

CHIP3 requires chemical suppliers to provide **Safety Data Sheets** to the recipient of a chemical. The Safety Data Sheets must contain sufficient information to allow the user to decide how to protect people and the environment, and this includes providing the classifications of the substances within a preparation.

If the Safety Data Sheets for a chemical indicate a hazardous property, then a waste containing that chemical has the potential to be hazardous. Waste holders need to consider if:

- the concentrations of "*dangerous substances*" in the waste, after use of the product, remain sufficient to be hazardous; or
- any reactions take place during the use of the product which may remove the hazard or create new/different hazards from those of the product.

Labels on chemical containers should also show the risk phrases associated with a product and the substances found within a product, along with indications of the danger, i.e. symbols, which should not be mistaken as the category of danger or hazards (See Section 3.1.9). The information on labels is not as comprehensive as that provided on Safety Data Sheets.

Appendix D identifies some of the sources of data available and discusses data quality issues.

3.1.6 Step 5b: Is there any reason to indicate the waste may be hazardous (e.g. test results)?

Waste holders have a duty to determine if a "*mirror entry*" waste is hazardous. Where:

- there are any reasons to indicate the waste may be hazardous, such as test results, knowledge of the production process or the raw materials used; and/or
- the composition of a waste is not known, cannot be determined or is insufficient to allow classification using the ASL or other sources (and considering worst case compounds).

The waste needs to be tested, where appropriate, to determine if it possesses any hazardous properties.

The HWD identifies the test methods in Annex V of Directive 67/548/EEC as the methods to be used to test for hazardous properties. Where a hazardous property test in Annex V is a non-mammalian test, that test should be performed on the waste. Where the test is mammalian-based, the Agencies views are that such tests should not be performed.

Note : It may not be appropriate to test for some hazardous properties (see Appendix C)

The Agencies consider that there are two options:

- perform a surrogate non-mammalian biological effect test; or
- if no means of non-mammalian testing is available, do not test, but ascertain from the producer or other previous waste holders information on the waste before you assume the waste is hazardous.

There are some tests that can assess a waste as hazardous without recourse to testing the waste on animals. These include simple inexpensive tests, such as flashpoint or pH determination that can be used to indicate that a waste is flammable or irritant/corrosive. Some tests do not define specific hazards but indicate that a waste is hazardous. Standard tests that are acceptable to the Agencies are given in the individual hazard assessments in Appendix C. Where a non-standard test is used the findings should be agreed with the Agencies.

It is not expected that a waste holder will assume an unknown waste is hazardous (or not) without rudimentary testing of the components of the waste, or ascertaining the nature of the waste from informed sources.

To assist with the classification of complex "*mirror entry*" wastes, Appendix B contains a section for each chapter of the EWC 2002 that highlights the range of components that may be present in the wastes covered by that EWC chapter.

3.1.7 Step 6: Does the waste possess any of the hazardous properties H1 to H14?

In order for a waste identified by a "*mirror entry*" to be hazardous it must "display" a hazardous property. The Hazardous Properties are listed in Table 2.1.

There are two methods of determining if a "*mirror entry*" waste is hazardous or not. These are:

- calculating whether the hazardous property is appropriate by referring to a threshold limit for a particular risk phrase; or
- testing to prove whether a particular hazardous property is present or not.

Calculating

For many wastes the most appropriate method is to identify the hazardous constituents/chemicals in the waste and then to use their concentrations in the waste to identify whether they confer hazardous properties on the waste.

- If a waste contains a dangerous substance(s) at a concentration at or above a threshold concentration for any of the hazardous properties H1 to H14, the waste will be hazardous and is categorised as the hazardous "*mirror entry*".
- If a waste contains a dangerous substance(s) at a concentration below the threshold for all of the hazardous properties, the waste will not be hazardous and is categorised as the non-hazardous "*mirror entry*".

Testing

For some hazards testing of physical properties might be the most appropriate method. For example, to identify whether a liquid waste is flammable or not, for which the threshold is 55°C, a flashpoint determination is probably the simplest method. This is because the flashpoint depends upon the concentration of the flammable chemicals in the waste. Other examples of hazards where a test could be the simplest option are H1 "Explosive" and H2 "Oxidising".

As discussed in Step 5b, sometimes testing may be the only option to determine whether a waste is hazardous because of the complex nature of a waste; this is discussed in more detail in Appendix C. However testing may not be appropriate for all wastes or all hazardous properties.

Threshold concentrations

Article 2 of the EWC 2002 sets out thresholds for hazardous properties H3 to H8, H10 and H11, which are derived from Directive 88/379/EEC.

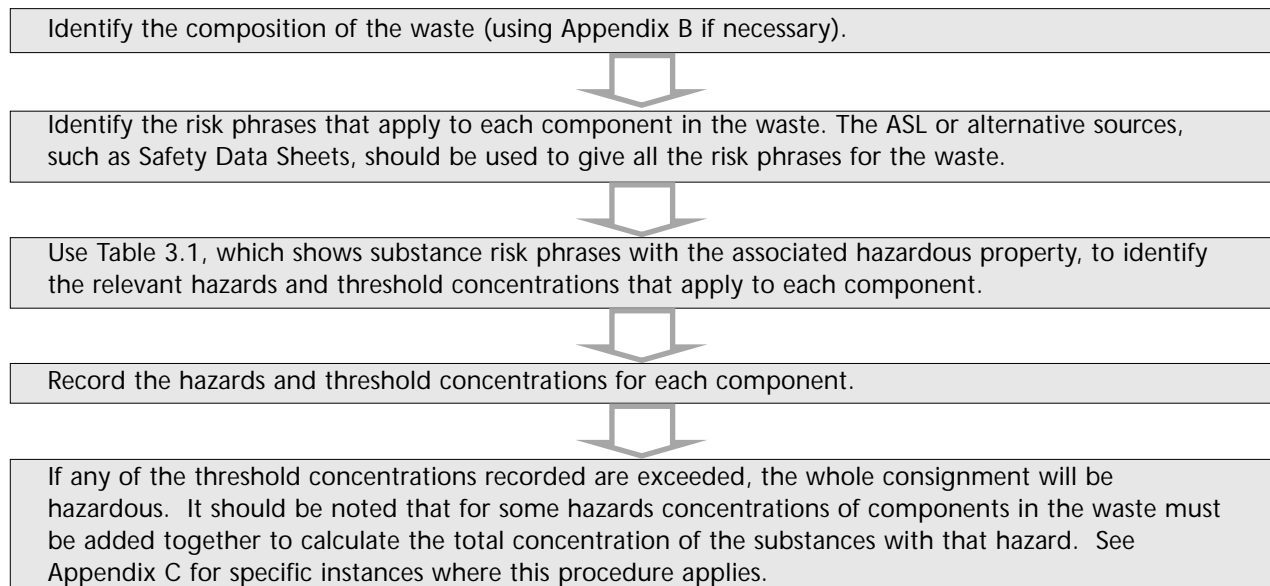
Threshold concentrations for the hazardous properties not covered by Article 2 (H1, H2, H3-A (second to fifth indents), H9, H12, H13 and H14 (with the exception of H9: Infectious⁹)), have been developed based on the classification and risk phrases from the CHIP3 which implement Directive 88/379/EEC. The thresholds for some of these hazards can be calculated, while others require testing of physical properties. The assessment of H9 has been developed based on the presence of infectious substance and this is set out in Appendix C9.

An assessment methodology for each hazardous property is set out Appendix C, and includes:

- definition of the hazardous property;
- relevant risk phrases;
- thresholds;
- a flow diagram setting out the assessment process for that hazardous property; and
- information on test methods.

Table 3.1 summarises the concentration thresholds for each risk phrase or group of risk phrases, how they relate to hazardous properties and when testing of physical properties should be used to determine the hazard.

In summary, for Steps 4 to 6:



⁹ CHIP3 does not cover infectious

Theoretical Example of Hazardous Waste Assessment Methodology

Waste A, produced in England, from a manufacturing process contains 10% of chemical X and 18% of chemical Y with the remainder being water.

Step 1: Waste A is a Directive Waste

Step 2: The domestic legislation does not contain specific provisions that relate to this waste.

Step 3: Waste A is listed with a "*mirror entry*" on the EWC 2002.

Step 4: The composition of the waste is known.

Step 5a: The waste does contain dangerous substances because:

Chemical X is listed on the ASL and is classified as F; R11, Xn: R20/22; and

Chemical Y, which is not listed on the ASL, has the classification of Xi: R36, Xn: R21 and N: R50, 53, on its Safety Data Sheets.

Water is not listed on the ASL and is not considered to be dangerous

Step 6: Based on the classifications of the chemical with Waste A could display the hazardous properties H3 (Highly Flammable/Flammable), H4 (Irritant), H5 (Harmful) and H14 (Ecotoxic):

A test is performed on the waste and the flashpoint is 75°C. H3-A "Highly Flammable" and H3-B "Flammable" can be discounted.

The threshold for Xi: R36 identified from Table 3.1 is 20%. This is not exceeded as the concentration of chemical Y is 18% and the waste will not be classified as H4 "Irritant".

Classifications Xn: R20/22 and Xn: R21 are appropriate to hazardous property, H5 "Harmful". The risk phrases for harmful are additive and the total concentration of substances with harmful risk phrases is 28%. The threshold concentration for harmful chemicals is 25% as given in Table 3.1. This threshold is exceeded. The waste should be classified as H5 "Harmful".

Risk phrase N: R50, 53 is appropriate to hazardous property H14 "Ecotoxic". The generic threshold concentration limit (see Appendix C14) for a single N: R50, 53 chemical is 0.25%. This threshold is exceeded and the waste should be classified as H14 "Ecotoxic".

Therefore Waste A is hazardous by H5 "Harmful" and H14 "Ecotoxic" and the hazardous "*mirror entry*" should be used.

Table 3.1: Classifications, Risk Phrases, Hazards and Hazardous Waste Threshold Limits

Classification		Substance Risk	Hazards	Hazardous Waste Threshold Limits	Comments
Category of Danger	Risk Phrase				
E	R1	Explosive when dry	H13 by H1	n/a	R1 is given the symbol E in the Approved Supply List but not in the Approved Classification and Labelling Guide. A waste containing substances with risk phrase R1 is a candidate for hazard H13 (by H1) because it may become dry during disposal.
E	R2	Risk of explosion by shock, friction, fire or other sources of ignition	H1	Test for explosive by ignition or shock	Tests are given in Appendix C1.
	R3	Extreme risk of explosion by shock, friction, fire or other sources of ignition			
N/a	R4	Forms very sensitive explosive metallic compounds	H13 by H1	n/a	A waste containing substances with these risk phrases is a candidate for hazard H13 (by H1).
	R5	Heating may cause an explosion			
	R6	Explosive with or without contact with air			
O	R7	May cause fire	H2	Test and/or calculation	Tests are given in Appendix C2; however, test does not apply to organic peroxides.
	R8	Contact with combustible material may cause fire			
	R9	Explosive when mixed with combustible material			
N/a	R10	Flammable	H3B	Flashpoint: >21°C to 55°C	Tests are given in Appendix C3.
F	R11	Highly flammable	H3A(i) (H3B) H3A(iii)	H3A(i) fpt ≤21°C H3A(iii) test	H3A(i) applies to liquids. H3A(iii) applies to solids.
F+	R12	Extremely flammable	H3A(i) (H3B)	H3A(i) fpt ≤21°C H3A(iv) test	H3A(iv) applies to gases. Tests are given in Appendix C3.

Classification		Substance Risk	Hazards	Hazardous Waste Threshold Limits	Comments
Category of Danger	Risk Phrase				
N/a	R14	Reacts violently with water	n/a	n/a	This is an additional risk phrase and such a risk phrase alone will not cause a waste to be hazardous.
F	R15	Contact with water liberates extremely flammable gases	H3A(v)	Test and/or calculation	Applies to solids and liquids in the waste. Test is given in Appendix C3.
N/a	R16	Explosive when mixed with oxidising substances	H13 by H1	n/a	A waste containing substances with these risk phrases is a candidate for hazard H13 (by H1).
F	R17	Spontaneously flammable in air	H3A(ii)	Test	Applies to solids, liquids and gases. Test is given in Appendix C3.
N/a	R18	In use may form flammable/explosive vapour-air mixture	H13 by H1 H2 or H3	n/a	A waste containing substances with these risk phrases is a candidate for hazard H13 (by H1, H2 or H3).
	R19	May form explosive peroxides			
X _n	R20	Harmful by inhalation	H5	≥ 25%	Threshold limit applies to the total concentration of substances classified as Harmful. Therefore the concentrations of substances with these risk phrases are additive along with the concentrations of substances with risk phrases R65 and those with combined/joint risk phrase with R48 and X _n R68.
	R21	Harmful in contact with skin			
	R22	Harmful if swallowed			
T	R23	Toxic by inhalation	H6 (H5)	≥ 3%	Threshold limit applies to the total concentration of substances classified as Toxic. Therefore the concentrations of substances with these risk phrases are additive along with the concentrations of substances with combined/joint risk phrase with R39 or R48.
	R24	Toxic in contact with skin			
	R25	Toxic if swallowed			

Classification		Substance Risk	Hazards	Hazardous Waste Threshold Limits	Comments
Category of Danger	Risk Phrase				
T+	R26	Very toxic by inhalation	H6 (H5)	≥ 0.1%	Threshold limit applies to the total concentration of substances classified as Very Toxic. Therefore the concentrations of substances with these risk phrases are additive along with the concentrations of substances with combined/joint risk phrase with R39.
	R27	Very toxic in contact with skin			
	R28	Very toxic if swallowed			
N/a	R29	Contact with water liberates toxic gas	H12	Test and/or calculation	Test is given in Appendix C12.
N/a	R30	Can become highly flammable in use	n/a	n/a	This is an additional risk phrase and such a risk phrase alone will not cause a waste to be hazardous.
N/a	R31	Contact with acids liberates toxic gas	H12	Test and/or calculation	Test is given in Appendix C12.
	R32	Contact with acids liberates very toxic gas			
N/a	R33	Danger of cumulative effects	n/a	n/a	R33 is used when R48 is not warranted due to the degree of danger posed and will not constitute a hazardous waste in isolation.
C	R34	Causes burns	H8 (H4)	≥ 5%	The concentrations of substances with R34 are additive. However, they are not additive with corrosive substances assigned R35.
C	R35	Causes severe burns	H8 (H4)	≥ 1%	The concentrations of substances with R35 are additive. However, they are not additive with corrosive substances assigned R34.
X _i	R36	Irritating to the eyes	H4	≥ 20%	The concentrations of substances with these risk phrases are additive. However, they are not additive with irritant substances assigned R41.
	R37	Irritating to the respiratory system			
	R38	Irritating to the skin			

Classification		Substance Risk	Hazards	Hazardous Waste Threshold Limits	Comments
Category of Danger	Risk Phrase				
T T+	R39	Danger of very serious irreversible effects	H6 (H5)	≥ 3%(T) ≥ 0.1%(T+)	R39 is only used in conjunction with combinations of R23, R24, R25 or R26, R27, R28, which are used to identify the exposure route. Threshold limit will depend whether R39 is used in conjunction with a toxic or very toxic substance. Threshold limit applies to the total concentration of substances classified as Toxic or Very Toxic and should be added to the concentrations of substances with the same classification.
Carc.Cat.3	R40	Limited evidence of a carcinogenic effect	H7	≥ 1%	The concentration of an individual substance assigned R40 must be above the threshold limit.
X _i	R41	Risk of serious damage to the eyes	H4	≥ 10%	The concentrations of substances with R41 are additive. However, their concentrations cannot be added with irritant substances assigned R36, R37 or R38.
X _n	R42	May cause sensitisation by inhalation	n/a	n/a	Sensitisation has no associated hazard in the HWD and will not constitute a hazardous waste in isolation.
X _i	R43	May cause sensitisation by skin contact			
N/a	R44	Risk of explosion if heated under confinement	H13 by H1	n/a	A waste containing substances with these risk phrases is a candidate for hazard H13 (by H1).
Carc.Cat.1 Carc.Cat.2	R45	May cause cancer	H7	≥ 0.1%	The concentration of an individual substance assigned R45 must be above the threshold limit.
Muta.Cat.1 Muta.Cat.2	R46	May cause heritable genetic damage	H11	≥ 0.1%	The concentration of an individual substance assigned R46 must be above the threshold limit.

Classification		Substance Risk	Hazards	Hazardous Waste Threshold Limits	Comments
Category of Danger	Risk Phrase				
X _n T	R48	Danger of serious damage to health by prolonged exposure	H5 H6 (H5)	≥ 25% (H6) ≥ 3% and < 25%(H5)	R48 is only used in conjunction with combinations of R20, R21, R22 or R23, R24, R25, which are used to identify the exposure route. Threshold limit will depend whether R48 is used in conjunction with a toxic or harmful substance. Threshold limit applies to the total concentration of substances classified as Harmful or Toxic and should be added to the concentrations of substances with the same classification.
Carc.Cat.1 Carc.Cat.2	R49	May cause cancer by inhalation	H7	≥ 0.1%	The concentration of an individual substance assigned R49 must be above the threshold limit.
N	R50	Very toxic to aquatic organisms	H14	See Appendix C14	The interrelationship between these risk phrases is complex, with different combinations of risk phrases being additive depending on the particular effect being considered. Therefore if a waste contains a range of substances with a range of these risk phrases, it is recommended that the detailed guidance in Appendix C14 is used to consider the additive effects.
N	R50-53	Very toxic to aquatic organisms and may cause long-term effects in the aquatic environment	H14	See Appendix C14	
N	R51-53	Toxic to aquatic organisms and may cause long-term effects in the aquatic environment	H14	See Appendix C14	
N/a	R52-53	Harmful to aquatic organisms and may cause long-term effects in the aquatic environment	H14	See Appendix C14	
N/a	R52	Harmful to aquatic organisms	H14	See Appendix C14	
N/a	R53	May cause long-term effects in the aquatic environment	H14	See Appendix C14	

Classification		Substance Risk	Hazards	Hazardous Waste Threshold Limits	Comments
Category of Danger	Risk Phrase				
N	R54	Toxic to flora	H14	Not available	Criteria for preparations containing substances with risk phrases relating to the terrestrial environment, i.e. R54 to R58, are not currently included in the Dangerous Preparation Directive (DPD). The classification of preparations using these risk phrases will be included in the DPD when detailed criteria for use of these risk phrases have been developed for the Dangerous Substances Directive. Therefore until the detailed criteria have been developed risk phrases R54 to R58 should not be considered when assessing hazardous waste.
	R55	Toxic to fauna			
	R56	Toxic to soil organisms			
	R57	Toxic to bees			
	R58	May cause long-term adverse effects in the environment			
N	R59	Dangerous for the ozone layer	H14	≥ 0.1%	Substances that are listed in Annex I to Council Regulation (EC) No 2037/2000 on substances that deplete the ozone layer and its subsequent amendments are classified as R59.
Repr.Cat.1	R60	May impair fertility	H10	≥ 0.5%	The concentration of an individual substance assigned R60 or R61 must be above the threshold limit.
Repr.Cat.2	R61	May cause harm to the unborn child			
Repr.Cat.3	R62	Possible risk of impaired fertility	H10	≥ 5%	The concentration of an individual substance assigned R62 or R63 must be above the threshold limit.
	R63	Possible risk of harm to the unborn child			
N/a	R64	May cause harm to breast-fed babies	n/a	n/a	This is an additional risk phrase and such a risk phrase alone will not cause a waste to be hazardous.
X _n	R65	Harmful: may cause lung damage if swallowed	H5	≥ 25%	Threshold limit applies to the total concentration of substances classified as Harmful. Therefore the concentrations of substances with R65 are additive with the concentrations of substances with risk phrases R20, R21, R22 and those with combined/joint risk phrase with R48 and X _n R68.

Classification		Substance Risk	Hazards	Hazardous Waste Threshold Limits	Comments
Category of Danger	Risk Phrase				
N/a	R66	Repeated exposure may cause skin dryness or cracking	n/a	n/a	This is an additional risk phrase and such a risk phrase alone will not cause a waste to be hazardous.
N/a	R67	Vapour may cause drowsiness and dizziness	n/a	n/a	This is an additional risk phrase and such a risk phrase alone will not cause a waste to be hazardous.
Muta.Cat.3	R68	Possible risk of irreversible effects	H11	≥ 1% (H11)	The concentration of an individual substance assigned Muta.Cat.3; R68 must be above the threshold limit.
X _n	R68	Possible risk of irreversible effects	H5	≥ 25% (H5)	X _n R68 is only used in conjunction with combinations of R20, R21, R22, which are used to identify the exposure route. Threshold limit applies to the total concentration of substances classified as Harmful. Therefore the concentrations of substances with X _n R68 are additive with the concentrations of substances with risk phrases R20, R21, R22, R65 and those with combined/joint risk phrase with R48.

KEY

N/a not applicable

H3A (i) H3A (first indent) "Highly flammable": - liquid substances and preparations having a flashpoint ≤ 21°C (including extremely flammable liquids).

H3A (ii) H3A (second indent) "Highly flammable": - substances and preparations which may become hot and finally catch fire in contact with air at ambient temperature without any application of energy.

H3A (iii) H3A (third indent) "Highly flammable": - 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 source of ignition.

H3A (iv) H3A (fourth indent) "Highly flammable": - gaseous substances and preparations which are flammable in air at normal pressure.

H3A (v) H3A (fifth indent) "Highly flammable": - substances and preparations which, in contact with water or damp air, evolve highly flammable gases in dangerous quantities.

3.1.8 Notes on using Table 3.1

Hazardous waste holders should be aware of the following issues when using Table 3.1.

Concentration effects

The classification assigned to a substance relates to the substance in its pure (100%) form. If a substance is not pure or is present as a component of a complex mixture the same hazard may not apply. As an example, ethanol is classified in the ASL as F: R11, which indicates that at 100% concentration it will have a flashpoint less than 21°C. However, an aqueous ("*mirror entry*") waste containing 4% w/w ethanol, will have a flashpoint greater than 55°C, and so will not be hazardous. At higher concentrations of ethanol, the flashpoint will reduce to between 21°C and 55°C so the waste will be hazardous by H3B "Flammable". At even higher concentrations the flashpoint will be less than 21°C so the waste will be hazardous by H3A (first indent) "Highly Flammable". As discussed above where wastes are concerned a flashpoint determination is probably appropriate to identify whether the waste is flammable or highly flammable. Table 3.1 shows the effect of such dilution by listing the subsidiary hazard in brackets e.g. H3A (first indent) (H3B).

Linked hazardous properties

Some hazardous properties are linked because they relate to the same effect:

- H4 "Irritant" and H8 "Corrosive" are linked because they both refer to the potential for harm or damage to tissue. Preparations containing corrosive substances can exhibit either corrosive or irritant properties dependent upon concentration of the corrosive substance. However, substances classified as irritant cannot become corrosive.

Concentrations of irritant and corrosive chemicals and concentrations of chemicals with the classification C: R34 and C: R35 are not additive when assessing hazardous waste.

- H5 "Harmful" and H6 "Toxic" (including "Very Toxic") are linked because they both relate to acute lethal effects. Preparations containing toxic or very toxic substances can exhibit either toxic or harmful properties dependent upon concentration of the toxic or very toxic substance. Substances classified as harmful, however, cannot be toxic at any concentration.

Concentrations of very toxic, toxic and harmful chemicals are not additive when assessing hazardous waste.

Testing and calculation

For certain risk phrases the indicated option is testing and/or calculating: ie testing; or calculating; or both testing and calculating. In such cases the testing relates to the physical properties of a waste. The relevant hazards are:

- H1 "Explosive": the explosive nature of a waste cannot be determined by calculation, therefore testing is required. See Appendix C1 for details of test methods.
- H2 "Oxidising": for organic peroxides a calculation method is available, with testing required for other substances that may potentially exhibit hazard H2. See Appendix C2 for details of both calculation and test methods.
- H3A (fifth indent) "Highly Flammable" and H12: a calculation or test is always required. If the composition of the waste is available the gas evolution should be calculated. Alternatively, the waste can be tested to determine whether 1 kg of the waste will evolve 1 litre of a highly flammable gas (the test for H3A (fifth indent)) or a toxic/very toxic gas (the test for H12) in one hour, on addition of water or acid as appropriate. See Appendices C3 and C12 for details of both calculation and test methods.

Additional risk phrases

The Approved Classification and Labelling Guide identifies a number of “additional risk phrases”. When substances are classified with an “additional risk phrase” such a risk phrase alone will not cause a waste to be hazardous. As an example, red phosphorus is given risk phrases F: R11 (highly flammable) and R16 (explosive when mixed with oxidising substances) in the ASL. Red phosphorus is hazardous by virtue of H3A (third indent) “Highly Flammable”, due to risk phrase R11 but is not hazardous due to R16. However, if mixed with oxidising substances the resulting mixture might be classified as H1 “Explosive”, for which a test would be required.



Other risk phrases that are similar to R16 in this respect are R4, R5, R6, R14, R18, R19, R30, R44 and R64. Some of these risk phrases may give rise to hazard H13 (substances and preparations capable by any means, after disposal, of yielding another substance which possesses hazards H1 to H12).

3.1.9 Other important notes on the use of CHIP3 to assess hazardous waste

Waste producers familiar with CHIP3 must be aware of the differences when using CHIP3 to assess hazardous waste.

- The “conventional method” used in CHIP3 to determine the classification of preparations cannot be used for determining the classification of a hazardous waste. For example, the concentrations of a “very toxic” substance and a “toxic” substance cannot be added when assessing hazardous properties whereas they may be for CHIP3 purposes. See “Linked hazardous properties” in Section 3.1.8.
- Articles such as electronic equipment are not classified as hazardous by CHIP3. However, determining if such wastes are hazardous means determining whether they, or their components, possess any hazardous properties. This should be done by considering the classifications of the substances within the article or component, and their threshold concentrations with reference to the weight of the article, or component. The availability of substances is not considered when assessing hazardous waste.
- The ASL considers some preparations such as blends of oils as substances. For the purposes of classifying hazardous wastes, waste can also be considered as a substance, e.g. for the purposes of testing, although it remains simpler to classify waste by knowing its chemical constituents.
- The category “Sensitising” (risk phrases R42 and R43) has no associated hazard in the HWD and will not constitute a hazardous waste.
- Threshold concentrations given in Part I of the ASL do not apply when classifying hazardous waste.
- Categories of danger and indications of danger should not be confused. An indication of danger is a symbol used for labelling purposes only and does not specify the category of danger or hazard, which is the information required to assess hazardous waste. Table 3.2 highlights the different hazardous properties covered by the indication of danger symbols “Harmful” and “Toxic”.

Table 3.2: Comparison of Indication of danger and Categories of danger in relation to Hazardous Waste

Indication of danger	Categories of danger	Hazardous Property	Hazardous Waste Threshold Limit
 Harmful	Harmful	H5	≥ 25%
	Irritant	H4	≥ 10% or ≥ 20% depending upon risk phrase
	Sensitising	N/a	N/a
	Carcinogenic, Category 3	H7	≥ 1%
	Toxic for reproduction, Category 3	H10	≥ 5%
	Mutagenic, Category 3	H11	≥ 1%
 Toxic	Toxic	H6	≥ 3%
	Very Toxic	H6	≥ 0.1%
	Carcinogenic, Categories 1 & 2	H7	≥ 0.1%
	Mutagenic, Categories 1 & 2	H10	≥ 0.1%
	Toxic for Reproduction, Categories 1 & 2	H11	≥ 0.5%