Hazardous Substances Information System - Guidance Material for Hazard Classifications

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1 Introduction

This guidance material provides:

- an overview of the Hazardous Substances Regulatory Framework and how it relates to the Hazardous Substances Information System (HSIS)
- a guide to the source of the hazard classification data in the HSIS and explanation of the information fields
- information about how to use HSIS to classify substances and mixtures
- a list of all relevant risk and safety phrases
- a worked example of a classified mixture

This guidance material is focussed on the hazard classification information in the HSIS. Separate guidance material covering the exposure standard features is available through the "Search Exposure Standards" page of the HSIS.

2 The Hazardous Substances Regulatory Framework

The Hazardous Substances Regulatory Framework (HSRF) is primarily supported by the following instruments:

- *National Model Regulations for the Control of Workplace Hazardous Substances* [NOHSC:1005(1994)][1] (which is produced under the same cover as the National Code of Practice);
- *National Code of Practice for the Control of Workplace Hazardous Substances* [NOHSC:2007(1994)] [2];
- *National Code of Practice for the Preparation of Material Safety Data Sheets,* 2nd Edition [NOHSC:2011(2003)] [3];
- *National Code of Practice for the Labelling of Workplace Substances* [NOHSC:2012(1994)] [4];
- *Approved Criteria for Classifying Hazardous Substances,* [NOHSC:1008(2004)] 3rd Edition[5] (the Approved Criteria); and
- *National Model Regulations for the Control of Workplace Hazardous Substances Part 2 – Scheduled Carcinogenic Substances* [NOHSC:1011(1995)] [6]; and
- *Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment* [NOHSC:1003(1995)] [7] (the Adopted National Exposure Standards)

The Hazardous Substances Regulatory Framework is further supported by the following Safe Work Australia instruments:

- *Guidance Note for the Assessment of Health Risks Arising from the Use of Hazardous Substances in the Workplace* [NOHSC:3017(1994)] [8];
- *Guidance Note for the Control of Workplace Hazardous Substances in the Retail Sector* [NOHSC:3018(1994)] [9];

The *National Model Regulations for the Control of Workplace Hazardous Substances* [NOHSC:1005(1994)] [1] are the basis for hazardous substance regulations in Australian Government, State and Territory jurisdictions. Under the National Model Regulations[1], manufacturers and importers of substances supplied for use at work are required to determine whether they are hazardous to health before supply. They are also required to produce labels and Material Safety Data Sheets (MSDS) for all hazardous substances, with appropriate information about the hazards of these substances.

3 The Approved Criteria for Classifying Hazardous Substances

The basis for determining whether a substance is a hazardous substance is the *Approved Criteria for Classifying Hazardous Substances* [NOHSC(1008:2004)] 3rd Edition[5] (the Approved Criteria). The classification criteria used in the Approved Criteria are adopted from European Community's (EC) legislation for classifying dangerous substances. The criteria are taken from:

- EC Council Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances (Dangerous Substances Directive, DSD)[10]; and,
- Directive 1999/45/EC[11] of the European Parliament and of the Council of 31 May 1999 concerning the approximation of the laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations (the Dangerous Preparations Directive, DPD).

To take into account technical progress and changes in the EC Council Directives, the classification criteria contained in the Approved Criteria are updated from time to time. The third edition was updated to generally reflect the current status of:

- EC Council Directive 67/548/EEC as amended by Commission Directive 2001/59/EC[12] of 6 August 2001, and;
- Directive 1999/45/EC of the European Parliament and of the Council of 31 May 1999 as amended by Commission Directive 2001/60/EC[13] of 7 August 2001.

The third edition of the Approved Criteria [NOHSC:1008(2004)][5] came into effect on 31 December 2004.

In order to help manufacturers, importers and suppliers apply the classifications that result from application of the Approved Criteria, NOHSC previously published the *List of Designated Hazardous Substances* (the List), which is a list of the more commonly used workplace hazardous substances. The List was designed as an advisory document to provide the first reference point for suppliers to determine if any substance they supply is hazardous and give guidance on appropriate risk and safety information. Two editions of the List were published as [NOHSC:10005(1994)] [14] and [NOHSC:10005(1999)].[15]

The second edition of the List [NOHSC:10005(1999)][15] generally reflected the status of Annex 1 of EEC Council Directive 67/548/EEC (as updated by EC Council Directive 96/54/EC[16]).

4 Hazardous Substances Information System (HSIS)

The HSIS is an internet database that allows you to find information on hazardous substances that have been classified in accordance with the Approved Criteria [NOHSC:1008(2004][5] and/or have National Exposure Standards declared under the Adopted National Exposure Standards [NOHSC:1003(1995)][7] and subsequent updates.

HSIS provides searchable access to two data sets, one for hazardous substance information and the other for exposure standard information. HSIS also provides access to consolidated lists of all substances included in the hazardous substances part of the database.

The hazardous substance data set contains records from the following sources:

- Annex 1 of EEC Council Directive 67/548/EEC, up to and including and including Commission Directive 2001/59/EC[12] of 6 August 2001 adapting to technical progress for the 28th time Council Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances.
- Substances with National Exposure Standards declared under the Adopted National Exposure Standards[7] including those declared as updates to the Adopted National Exposure Standards[7] since 1995.
- Other substances that have been notified to Safe Work Australia as being hazardous substances according to the Approved Criteria, including various agricultural and veterinary chemicals and industrial chemicals. The majority of these classifications are derived from assessments from the National Industrial Chemical Assessment and Notification Scheme (NICNAS).

In addition to the searchable database, the following two documents are provided through HSIS:

- **Hazardous Substances Information System – Consolidated Lists – CAS Number Index**
- **Hazardous Substances Information System – Consolidated Lists – Alphabetical Index**

These documents provide consolidated listings of the entries in the searchable database of classified substances.

The EC Directives[12,13] on which the Approved Criteria[5] is based include criteria for classifying substances or preparations on the basis of their physicochemical properties or environmental effects. In the Approved Criteria, the European criteria for physicochemical properties or environmental effects are provided only as appendices. They do not form a mandatory part of the Approved Criteria, but are provided for information only.

Substances in the HSIS database that have classifications where only physicochemical and/or environmental effects have been assigned are listed for information in appendices to the consolidated lists.

Substances with Australian exposure standards are included in the searchable database and the consolidated lists, although hazard classifications for these substances are generally not provided. More information on the status of these entries is provided in the Classification section of this document.

The absence of an entry in the HSIS for a particular substance is not necessarily an indication that the substance would not meet the criteria for classification as a hazardous substance. A determination against the Approved Criteria[5] must be made for all unlisted substances.

5 Explanation of information fields in the HSIS

5.1 Substance Name

Every entry contains information in this field. The substance name may be the recognised chemical name, the common name or, in some cases, a generic name. Names in this field are those appearing in the sources used to compile the HSIS together with synonyms obtained from Australian reference publications. For this reason, substance names in the

HSIS may not necessarily accord with the recognised chemical names. Further useful chemical name information can be found in the NICNAS Australian Inventory of Chemical Substances and the USA National Library of Medicine ChemID databases at the following locations:
http://www.nicnas.gov.au/Industry/AICS/Search.asp
http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?CHEM

In some cases there is more than one accepted spelling of a substance name. For example, sulphur may appear as 'sulfur' in the name of a hazardous substance or an exposure standard.

The listing of synonyms for a substance is not necessarily exhaustive.

5.2 Chemical Abstract Service Registry Number

A Chemical Abstract Service Registry Number (CAS Number) is assigned to a single chemical by the Chemical Abstract Service based in the United States. Some mixtures are also assigned a CAS Number.

5.3 United Nations Number (UN Number)

HSIS is primarily intended to be a source of information on the *health hazard* classifications that result from application of the Approved Criteria. Information related to Dangerous Goods classification (i.e. UN numbers) is provided as supplementary information and has been checked for accuracy as far as is practicable. A definitive source of UN numbers can be found in the *Australian Dangerous Goods Code*[17] and this should be consulted where appropriate.

The UN number is a four-digit identification number developed by the United Nations Committee of Experts on the Transport of Dangerous Goods (UNCETDG). UN numbers may be assigned to a single substance or to a group of substances with similar characteristics or hazardous properties.

Some substances on the HSIS have more than one UN number listed. Different numbers are often used by the United Nations Committee of Experts on the Transport of Dangerous Goods to differentiate between:

- physical properties, for example, a solid or liquid substance; and
- levels of impurities or activity, for example, the available chlorine or degree of hydration.

Not all substances on the HSIS, that could be a Dangerous Goods, have been classified and allocated a UN number.

5.4 Classification

The majority of substances on the HSIS have been classified based on their health effects and assigned Risk and Safety Phrases and concentration cut-off levels. Classifications based on physicochemical and environmental effects are provided for information only.

Some substances are included in HSIS because they have a national exposure standard for a particular form (eg zinc oxide fume).

Substances listed in the Adopted National Exposure Standards[7] are classified as hazardous according to the Safe Work Australia criteria but this hazard is concerned with **ATMOSPHERIC CONTAMINATION**. That is, a solid or liquid substance does not

necessarily present a hazard because of its listing in the Adopted National Exposure Standards[7]. These standards for occupational exposure are concerned **with concentrations of substances in the atmosphere of gases, vapours, fumes, mists, aerosols and the like**. However processing (accidental or intentional) of such solids or liquids in the occupational environment may release atmospheric hazards.

Where such a substance is included in HSIS without hazard classification data the manufacturer or importer of the substance will have responsibilities to determine its hazard classification in accordance with the Approved Criteria[5].

Full details of the process for classifying mixtures are presented in the Approved Criteria[5].

5.5 Labelling

The labelling column includes abbreviated classification data and the details of the required risk and safety phrases for health hazards. Risk and safety phrases for physicochemical and environmental criteria are supplied for information purposes only.

For more details on the application of risk and safety phrases to labels, refer to the *National Code of Practice for the Labelling of Workplace Substances* [NOHSC:2012(1994)][4].

5.6 Risk and Safety Phrases

Risk phrases convey a general description of the physicochemical, environmental and health hazards of a substance. Safety phrases provide information on safe storage, handling, disposal, personal protection and first aid.

Risk and safety phrases appear in the HSIS as a series of numbers coded according to the European Union system. In the HSIS outputs, risk and safety phrases are expressed either as single numbers to denote separate statements or with an oblique stroke (/) linking more than one number to denote a combined statement of the phrases involved. Risk Phrase numbers are preceded by an ‘R’ and safety phrase numbers are preceded by an ‘S’.

The full list of risk and safety phrases can be found in Appendix 2.

The risk phrases associated with health hazards are the only ones required for health hazard assessment. The environmental and physicochemical phrases are provided for information purposes only.

The HSIS also includes safety phrases for most substances. The identification of safety phrases is not an integral part of classification, but is important for the production of labels and MSDS. The selection of appropriate safety phrases for these purposes is discussed in the *National Code of Practice for the Labelling of Workplace Substances* [NOHSC:2012(1994)][4] and the *National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition* [NOHSC:2011(2003)][3] respectively.

5.7 Concentration Cut-off Levels

A concentration cut-off level for a substance is the level (expressed as a percentage on a weight/weight basis for solids and liquids and a volume/volume basis for gases) at and above which that substance is classified as a hazardous substance.

A mixture is classified as a hazardous substance if it contains at least one ingredient at a concentration equal to, or above, the lowest concentration cut-off level given for that ingredient.

Concentration cut-off levels refer to health hazards only, and are not associated with the physicochemical or environmental hazards of a substance.

The health effects of certain types of hazardous substances are regarded as additive. Due to additive effects, a mixture may be classified as hazardous even if all of the individual substances in the mixture are present at levels below their respective cut offs. For a full discussion of classification of mixtures and additive effects, refer to the Approved Criteria[5].

Concentration cut-off levels have been assigned in accordance with the Approved Criteria[5] unless individually listed in Annex I of the European Union legislation on dangerous substances. Substances assessed under the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) may also have cut-off levels, which differ from those that would be assigned according to the Approved Criteria[5].

5.8 Source

This field shows where the entry has been derived from. Most of the entries are derived from European Union sources and are hence designated as ‘Eu’. Other sources include ‘A’ for Australian Exposure Standards. For full details see Appendix 1.

5.9 Using the HSIS to classify pure substances

A pure substance is a unique or distinct chemical entity. Impurities may be present generally up to a concentration of 0.1% before the substance should be considered a mixture and classified accordingly (see 'Using HSIS to classify mixtures').

All impurities should be checked against HSIS as a few substances, notably carcinogens, have concentration cut-off levels below 0.1%.

For pure substances, the risk phrases given in HSIS will allow a full classification of the hazardous substance with the appropriate health hazard categories.

To extract this information from HSIS, it is necessary to interpret the risk phrases given to determine the respective hazard category or categories.

The following table has been prepared to assist with this process. The risk phrases assigned in HSIS can be checked against the entries in the table to determine the appropriate hazard category.

Classification index for pure hazardous substances

Risk phrase(s)	*Health hazard category*
R20 and/or R21 and/or R22	Harmful
R23 and/or R24 and/or R25	Toxic
R26 and/or R27 and/or R28	Very Toxic
R33	Harmful
R34	Corrosive
R35	Corrosive
R36 and/or R37 and/or R38 and/or R41	Irritant
R39 plus R23 and/or R24 and/or R25	Toxic
R39 plus R26 and/or R27 and/or R28	Very Toxic
R40 [when used for Cat. 3 carcinogens]	Carc. Cat. 3, Harmful
R42	Harmful
R43	Irritant
R45 or R49 [when used for Cat. 1 carcinogens]	Carc. Cat. 1, Toxic
R45 or R49 [when used for Cat. 2 carcinogens]	Carc. Cat. 2, Toxic
R46 [when used for Cat. 1 mutagens]	Muta. Cat. 1, Toxic
R46 [when used for Cat. 2 mutagens]	Muta. Cat. 2, Toxic
R48 plus R20 and/or R21 and/or R22	Harmful
R48 plus R23 and/or R24 and/or R25	Toxic
R60 [when used for Toxic to reproduction fertility Cat. 1]	Repr. Cat. 1, Toxic
R60 [when used for Toxic to reproduction fertility Cat. 2]	Repr. Cat. 2, Toxic
R61 [when used for Toxic to reproduction development Cat. 1]	Repr. Cat. 1, Toxic
R61 [when used for Toxic to reproduction development Cat. 2]	Repr. Cat. 2, Toxic
R62 [when used for Toxic to reproduction fertility Cat. 3]	Repr. Cat. 3, Harmful
R63 [when used for Toxic to reproduction development Cat. 3]	Repr. Cat. 3, Harmful
R64	Harmful
R65	Harmful
R66	Other Toxicological Properties
R67	Other Toxicological Properties
R68 [when used for Cat. 3 mutagens]	Muta. Cat. 3, Harmful
R68 plus R20 and/or R21 and/or R22	Harmful

Cat.	*Category*
Carc.	*Carcinogen*
Muta.	*Mutagen*
Repr.	*Toxic to reproduction*

The full classification for a pure substance can then be prepared by listing the hazard category or categories obtained, together with the relevant risk phrases.

When classifying pure substances, the convention is to list the relevant hazard categories in the following order:
Very Toxic > Toxic > Harmful > Corrosive > Irritant >
Carcinogen > Mutagen > Toxic to Reproduction

For example, ethylene oxide would be classified as follows:
Toxic R23
Irritant R36/37/38
Carcinogen (category 2) R45
Mutagen (category 2) R46

Note that the most hazardous category for the pure substance can be found in the top line of both the labelling and cut-off columns. This category will supersede the lesser categories but may diminish with dilution in mixture formulas.

A full classification of a substance is fundamental to the correct assignment of concentration cut-off levels and is therefore important to manufacturers and importers when formulating mixtures (see 'Using HSIS to classify mixtures').

The *National Code of Practice for the Labelling of Workplace Substances* [NOHSC:2012(1994)][4] provides further guidance for assigning risk and safety phrases in the preparation of labels.

6 Using the HSIS to classify mixtures

A mixture is a physical combination of chemical substances resulting from either the deliberate mixing of substances or from a chemical reaction.

6.1 Determining if a mixture is a hazardous substance

A mixture may be determined to be a hazardous substance by either:

(a) considering the health effects of the whole substance if the mixture has been tested as a whole; or
(b) by assessing the health effects of each ingredient if the mixture has not been tested as a whole.

To determine whether a mixture is a hazardous substance by using the HSIS, the following process is recommended:

Step 1: Identify each ingredient in the HSIS using one or more of the 'substance identification' information fields, that is, substance name, CAS Number or UN number.

Step 2: Determine whether the concentration of each ingredient is above the minimum concentration cut-off level. If any ingredient is present above its minimum concentration cut-off level, then the mixture is determined to be hazardous.

Should any ingredient in the mixture not appear on the HSIS, or is listed without at least one concentration cut-off level, **the Approved Criteria[5] will need to be used in addition to the HSIS to classify the mixture.**

If a mixture contains more than one ingredient that is in the HSIS consolidated listing, and all ingredient concentrations are below their respective minimum concentration cut-off levels (last entry cut-offs column), the mixture may still be considered hazardous if one or more of these ingredients exhibit corrosive, irritant or acute lethal effects. **The formulae in the Approved Criteria[5] will need to be used in addition to the HSIS to classify the mixture.**

6.2 Determining the hazard classification of a mixture

The process of classifying mixtures involves the identification of hazard category and risk phrases for each hazardous ingredient (at specific concentrations), which are then combined to provide the overall hazard category and risk phrases for the mixture.

In the case of a mixture containing several hazardous substances, it will be helpful to complete a classification table, such as the one shown below, to record the information extracted from HSIS.

Classification table for hazardous ingredient(s)		
	Classification	
Concentration (conc.) limits	Hazard Category	Risk phrases
Conc. ≥		
≤ Conc. <		
≤ Conc. <		
≤ Conc. <		
≤ Conc. <		

The following steps show how the HSIS can be used to classify mixtures:

Step 1 Identify each ingredient using one or more of the 'substance identification' information fields, that is, substance name, CAS Number or UN number.

Step 2 Determine whether the concentration of each ingredient is above the minimum concentration cut-off level. If any ingredient is present above its minimum concentration cut-off level, then the mixture is determined to be hazardous.

Step 3 To classify a hazardous mixture, take each ingredient in turn and using the cut-offs column, transcribe the details from the line entry for the relevant concentration into the classification table.

Step 4 Read off the hazard category and risk phrases from the tables for each ingredient at the specific concentrations that each ingredient is present in the mixture.

Step 5 Determine the overall hazard category for the mixture by combining all the hazard categories (for each ingredient) determined in Step 3. If more than one category from Harmful (Xn), Toxic (T) and Very Toxic (T^+) apply, use only one category according to the priority order $T^+ > T > Xn$. A mixture will only be classified as an Irritant (Xi) overall if it only contains hazardous ingredients classified as Xi.

Step 6 Combine all risk phrases for each ingredient (Step 3) to give the risk phrases appropriate for the mixture. Certain risk phrases should not be used together (such as R20 and/or R21 and/or R22 with R23 and/or R24 and/or R25, or R36 and/or R37 and/or R38 with R34 or R35). In these cases the most severe risk phrase is used. For example, R26, Very Toxic by inhalation, supersedes R23, Toxic by inhalation, supersedes R20, Harmful by inhalation.

Appendix 1: Notes, Abbreviations and Notations Used in HSIS

A. Abbreviations used in the 'Classification' and 'Labelling' columns

C	Corrosive
E	Explosive
F^+	Extremely Flammable
F	Flammable
N	Dangerous for the Environment
O	Oxidising
T^+	Very Toxic
T	Toxic
Xn	Harmful
Xi	Irritant
R	Risk phrase
S	Safety phrase

B. Guide to notes used in the 'Labelling' column

Note A: The name of the substance should appear on the label in the form of one of the designations given (under 'Name' or 'Synonyms'). Use is sometimes made of a general designation such as, '…compounds' or '…salts'. In this case, the manufacturer or any other person who markets such a substance should state on the label the correct chemical name.

Example: $BeCl_2$: beryllium chloride

Note B: Some substances (acids, bases etc) are placed on the market in aqueous solutions at various concentrations and therefore require different labelling since the hazards vary. For aqueous solutions, the label shown (under 'Labelling') is for the highest concentration range given under the concentration limits, which are shown (under 'Cut-offs'). For the lower concentration ranges, Safety Phrases should be selected according to the normal rules for preparations.

Under 'Name' or 'Synonyms' a general designation of the following type is used: '...% nitric acid'.

In this case the manufacturer or any other person who markets such a substance should give on the label the percentage concentration of the solution.

Example: 45% nitric acid

Unless otherwise stated, it is assumed that the percentage concentration is calculated on a weight/weight basis. The use of other data (for example, specific gravity) or descriptive phrases (for example, fuming or glacial) is permissible.

Note C: Some organic substances may be marketed either in a specific isomeric form or as a mixture of several isomers. Under 'Name' or 'Synonyms', a general designation of the following type is sometimes used: 'xylenol'

In this case the manufacturer or any other person who markets such a substance should state on the label whether the substance is a specific isomer (a) or a mixture of isomers (b).

Example:

(a) 2,4-dimethylphenol

(b) xylenol (mixture of isomers)

Note D: Certain substances, which are susceptible to spontaneous polymerisation or decomposition, are generally placed on the market in a stabilised form. This is the form that is listed in the database (under 'Name' or 'Synonyms'). However, such substances are sometimes placed on the market in a non-stabilised form. In this case, the manufacturer or any person who places such a substance on the market should state on the label the name of the substance followed by the words 'non-stabilised'.

Example: methacrylic acid (non-stabilised)

Note E: For substances ascribed Note E, the Risk Phrases R20, R21, R22, R23, R24, R25, R26, R27, R28 R39, R68 (harmful), R48 and R65 and all combinations of these Risk Phrases should be preceded by the word 'also'.

Examples:

R23: 'also toxic by inhalation'.

R27/28: 'also very toxic in contact with skin and if swallowed'

Note F: This substance may contain a stabiliser. If the stabiliser changes the dangerous properties of the substance, as indicated by the label (under 'Labelling'), a label should be provided in accordance with the rules for the labelling of dangerous substances.

Note G: This substance may be marketed in an explosive form in which case it should be evaluated using the appropriate test methods and a label should be provided reflecting its explosive property.

Note H: The classification and label shown for this substance applies to the dangerous property(ies) indicated by the Risk Phrase(s) in combination with the category(ies) of danger shown. The manufacturers, distributors and importers of this substance shall be obliged to carry out an investigation to make themselves aware of the relevant and accessible data which exists for all other properties to classify and label the substance. The final label shall follow the requirements of section 7 of Annex VI of directive 67/548/EEC. [10].

Note J: The classification as a carcinogen or mutagen need not apply if it can be shown that the substance contains less than 0.1% w/w benzene (EINECS no. 200-753-7). This note applies only to certain complex coal- and oil- derived substances in Annex I.

Note K: The classification as a carcinogen or mutagen need not apply if it can be shown that the substance contains less than 0.1% w/w 1,3 butadiene (EINECS no. 203-450-8). If the substance is not classified as a carcinogen or mutagen, at least the Safety Phrases (2-)9-16 should apply. This note applies to certain complex oil-derived substances in Annex I.

Note L: The classification as a carcinogen need not apply if it can be shown that the substance contains less than 3% DMSO extract as measured by IP 346. This note only applies to certain complex oil-derived substances in Annex I.

Note M: The classification as a carcinogen need not apply if it can be shown that the substance contains less than 0.005% w/w benzo[a]pyrene (EINECS no. 200-028-5). This note only applies to certain complex coal-derived substances in Annex I.

Note N: The classification as a carcinogen need not apply if the full refining history is known and it can be shown that the substance from which it is produced is not a carcinogen. This note only applies to certain complex oil-derived substances in Annex I.

Note P: The classification as a carcinogen or mutagen need not apply if it can be shown that the substance contains less than 0.1% w/w benzene (EINECS no. 200-753-7). When the substance is classified as a carcinogen or mutagen, Note E shall also apply. When the substance is not classified as a carcinogen or mutagen, at least the Safety Phrases (2-)23-24-62 shall apply. This note applies only to certain complex oil-derived substances in Annex I.

Note Q: The classification as a carcinogen need not apply if it can be shown that the substance fulfils one of the following conditions:

- a short-term biopersistence test by inhalation has shown that the fibres longer than 20µm have a weighted half life less than 10 days; or
- a short-term biopersistence test by intratracheal instillation has shown that the fibres longer than 20µm have a weighted half life less than 40 days; or
- an appropriate intra-peritoneal test has shown no evidence of excess carcinogenicity; or
- absence of relevant pathogenicity or neoplastic changes in a suitable long-term inhalation test.

Note R: The classification as a carcinogen need not apply to fibres with a length weighted geometric mean diameter less two standard errors greater than 6µm.

C. Guide to abbreviations used in the 'Source' column

A	Listed in the *Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment* [NOHSC:1003(1995)] [7].
Eu	Listed in the European Union's Annex I of the EEC Council Directive 67/548/EEC[10] (as updated by EEC Council Directive 2001/59/EC[12]).
N	National Industrial Chemicals Notification and Assessment Scheme (NICNAS).
R	Under Review.
V	Reviewed in the Australian Pesticides and Veterinary Medicine Authority (APVMA) program for agricultural and veterinary chemicals.
P	Recommendations from the Australian Institute of Petroleum.
Eu/N	Information from both the European Union and NICNAS (see **Eu** and **N** above) has been considered to arrive at the classification presented.
Eu/V	Information from both the European Union and APVMA (see **EU** and **V** above) has been considered to arrive at the classification presented.

D. Guide to abbreviations used in the 'H-Type' column

The abbreviations refer to the *hazard type* associated with the substance:

H	Health
D	Physicochemical
E	Environmental

Appendix 2: Risk and Safety Phrases

Key to risk phrases for health effects (includes combination risk phrases)

R20	Harmful by inhalation.
R21	Harmful in contact with skin.
R22	Harmful if swallowed.
R23	Toxic by inhalation.
R24	Toxic in contact with skin.
R25	Toxic if swallowed.
R26	Very toxic by inhalation.
R27	Very toxic in contact with skin.
R28	Very toxic if swallowed.
R29	Contact with water liberates toxic gas.
R31	Contact with acids liberates toxic gas.
R32	Contact with acids liberates very toxic gas.
R33	Danger of cumulative effects.
R34	Causes burns.
R35	Causes severe burns.
R36	Irritating to eyes.
R37	Irritating to respiratory system.
R38	Irritating to skin.
R39	Danger of very serious irreversible effects.
R40	Limited evidence of a carcinogenic effect.
R41	Risk of serious eye damage.
R42	May cause sensitisation by inhalation.
R43	May cause sensitisation by skin contact.
R45	May cause cancer.
R46	May cause heritable genetic damage.
R48	Danger of serious damage to health by prolonged exposure.
R49	May cause cancer by inhalation.
R60	May impair fertility.
R61	May cause harm to the unborn child.
R62	Possible risk of impaired fertility.
R63	Possible risk of harm to the unborn child.
R64	May cause harm to breastfed babies.
R65	Harmful: May cause lung damage if swallowed.

R66	Repeated exposure may cause skin dryness or cracking.
R67	Vapours may cause drowsiness and dizziness.
R68	Possible risk or irreversible effects.
R20/21	Harmful by inhalation and in contact with skin.
R20/22	Harmful by inhalation and if swallowed.
R20/21/22	Harmful by inhalation, in contact with skin and if swallowed.
R21/22	Harmful in contact with skin and if swallowed.
R23/24	Toxic by inhalation and in contact with skin.
R23/25	Toxic by inhalation and if swallowed.
R23/24/25	Toxic by inhalation, in contact with skin and if swallowed.
R24/25	Toxic in contact with skin and if swallowed.
R26/27	Very toxic by inhalation and in contact with skin.
R26/28	Very toxic by inhalation and if swallowed.
R26/27/28	Very toxic by inhalation, in contact with skin and if swallowed.
R27/28	Very toxic in contact with skin and if swallowed.
R36/37	Irritating to eyes and respiratory system.
R36/38	Irritating to eyes and skin.
R36/37/38	Irritating to eyes, respiratory system and skin.
R37/38	Irritating to respiratory system and skin.
R39/23	Toxic: danger of very serious irreversible effects through inhalation.
R39/24	Toxic: danger of very serious irreversible effects in contact with skin.
R39/25	Toxic: danger of very serious irreversible effects if swallowed.
R39/23/24	Toxic: danger of very serious irreversible effects through inhalation and in contact with skin.
R39/23/25	Toxic: danger of very serious irreversible effects through inhalation and if swallowed.
R39/24/25	Toxic: danger of very serious irreversible effects in contact with skin and if swallowed.
R39/23/24/25	Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.
R39/26	Very toxic: danger of very serious irreversible effects through inhalation.
R39/27	Very toxic: danger of very serious irreversible effects in contact with skin.
R39/28	Very toxic: danger of very serious irreversible effects if swallowed.
R39/26/27	Very toxic: danger of very serious irreversible effects through inhalation and in contact with skin.
R39/26/28	Very toxic: danger of very serious irreversible effects through inhalation and if swallowed.

R39/27/28	Very toxic: danger of very serious irreversible effects in contact with skin and if swallowed.
R39/26/27/28	Very toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.
R68/20	Harmful: possible risk of irreversible effects through inhalation.
R68/21	Harmful: possible risk of irreversible effects in contact with skin.
R68/22	Harmful: possible risk of irreversible effects if swallowed.
R68/20/21	Harmful: possible risk of irreversible effects through inhalation and in contact with skin.
R68/20/22	Harmful: possible risk of irreversible effects through inhalation and if swallowed.
R68/21/22	Harmful: possible risk of irreversible effects in contact with skin and if swallowed.
R68/20/21/22	Harmful: possible risk of irreversible effects through inhalation, in contact with skin and if swallowed.
R42/43	May cause sensitisation by inhalation and skin contact.
R48/20	Harmful: danger of serious damage to health by prolonged exposure through inhalation.
R48/21	Harmful: danger of serious damage to health by prolonged exposure in contact with skin.
R48/22	Harmful: danger of serious damage to health by prolonged exposure if swallowed.
R48/20/21	Harmful: danger of serious damage to health by prolonged exposure through inhalation and in contact with skin.
R48/20/22	Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
R48/21/22	Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
R48/20/21/22	Harmful: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
R48/23	Toxic: danger of serious damage to health by prolonged exposure through inhalation.
R48/24	Toxic: danger of serious damage to health by prolonged exposure in contact with skin.
R48/25	Toxic: danger of serious damage to health by prolonged exposure if swallowed.
R48/23/24	Toxic: danger of serious damage to health by prolonged exposure through inhalation and in contact with skin.
R48/23/25	Toxic: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
R48/24/25	Toxic: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
R48/23/24/25	Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.

Key to Risk Phrases for <u>non-health effects</u> (physicochemical: R1–19, R30, R44; environmental: R50–59)

R1	Explosive when dry.
R2	Risk of explosion by shock, friction, fire or other sources of ignition.
R3	Extreme risk of explosion by shock, friction, fire or other sources of ignition.
R4	Forms very sensitive explosive metallic compounds.
R5	Heating may cause an explosion.
R6	Explosive with or without contact with air.
R7	May cause fire.
R8	Contact with combustible material may cause fire.
R9	Explosive when mixed with combustible material.
R10	Flammable.
R11	Highly flammable.
R12	Extremely flammable.
R14	Reacts violently with water.
R15	Contact with water liberates extremely flammable gases.
R16	Explosive when mixed with oxidising substances.
R17	Spontaneously flammable in air.
R18	In use, may form flammable/explosive vapour-air mixture.
R19	May form explosive peroxides.
R30	Can become highly flammable in use.
R44	Risk of explosion if heated under confinement.
R50	Very toxic to aquatic organisms.
R51	Toxic to aquatic organisms.
R52	Harmful to aquatic organisms.
R53	May cause long-term adverse effects in the aquatic environment.
R54	Toxic to flora.
R55	Toxic to fauna.
R56	Toxic to soil organisms.
R57	Toxic to bees.
R58	May cause long-term adverse effects in the environment.
R59	Dangerous for the ozone layer.

Key to safety phrases (includes combination safety phrases)

S1	*Keep locked up.
S2	*Keep out of reach of children.
S3	Keep in a cool place.
S4	Keep away from living quarters.
S5	Keep contents under…(appropriate liquid to be specified by the manufacturer).
S6	Keep under…(inert gas to be specified by the manufacturer).
S7	Keep container tightly closed.
S8	Keep container dry.
S9	Keep container in a well-ventilated place.
S12	Do not keep the container sealed.
S13	Keep away from food, drink and animal feeding stuffs.
S14	Keep away from …(incompatible materials to be indicated by the manufacturer).
S15	Keep away from heat.
S16	Keep away from sources of ignition - No smoking.
S17	Keep away from combustible material.
S18	Handle and open container with care.
S20	When using do not eat or drink.
S21	When using do not smoke.
S22	Do not breathe dust.
S23	Do not breathe gas/fumes/vapour/spray (appropriate wording to be specified by the manufacturer).
S24	Avoid contact with skin.
S25	Avoid contact with eyes.
S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S27	Take off immediately all contaminated clothing.
S28	After contact with skin, wash immediately with plenty of... (to be specified by the manufacturer).
S29	Do not empty into drains.
S30	Never add water to this product.
S33	Take precautionary measures against static discharges.
S35	This material and its container must be disposed of in a safe way.
S36	Wear suitable protective clothing.
S37	Wear suitable gloves.
S38	In case of insufficient ventilation, wear suitable respiratory equipment.

S39	Wear eye/face protection.
S40	To clean the floor and all objects contaminated by this material, use…(to be specified by the manufacturer).
S41	In case of fire and/or explosion do not breathe fumes.
S42	During fumigation/spraying wear suitable respiratory equipment (appropriate wording to be specified by the manufacturer).
S43	In case of fire use... (indicate in the space the precise type of fire-fighting equipment. If water increases the risk add: 'Never use water').
S45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S46	If swallowed, seek medical advice immediately and show this container or label.
S47	Keep at temperature not exceeding…...° C (to be specified by the manufacturer).
S48	Keep wetted with… (appropriate material to be specified by the manufacturer).
S49	Keep only in the original container.
S50	Do not mix with…(to be specified by the manufacturer).
S51	Use only in well ventilated areas.
S52	Not recommended for interior use on large surface areas.
S53	Avoid exposure-obtain special instructions before use.
S56	Dispose of this material and its container at hazardous or special waste collection point.
S57	Use appropriate container to avoid environmental contamination.
S59	Refer to manufacturer/supplier for information on recovery/recycling.
S60	This material and its container must be disposed of as hazardous waste.
S61	Avoid release to the environment. Refer to special instructions/Material Safety Data Sheets.
S62	If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.
S63	In case of accident by inhalation: remove casualty to fresh air and keep at rest.
S64	If swallowed, rinse mouth with water, (only if the person is conscious).
S1/2	Keep locked up and out of reach of children.
S3/7	Keep container tightly closed in a cool place.
S3/9/14	Keep in a cool, well ventilated place away from… (incompatible materials to be indicated by manufacturer).
S3/9/14/49	Keep only in the original container in a cool, well-ventilated place away from… (incompatible materials to be indicated by manufacturer).
S3/9/49	Keep only in the original container in a cool, well-ventilated place.
S3/14	Keep in a cool place away from… (incompatible materials to be indicated

	by the manufacturer).
S7/8	Keep container tightly closed and dry.
S7/9	Keep container tightly closed and in a well-ventilated place.
S7/47	Keep container tightly closed and at a temperature not exceeding… ^{o}C (to be specified by the manufacturer).
S20/21	When using do not eat, drink or smoke.
S24/25	Avoid contact with skin and eyes.
S27/28	After contact with skin, take off immediately all contaminated clothing, and wash immediately with plenty of…(to be specified by the manufacturer).
S29/35	Do not empty into drains; dispose of this material and its container in a safe way.
S29/56	Do not empty into drains, dispose of this material and its container at hazardous or special waste collection point.
S36/37	Wear suitable protective clothing and gloves.
S36/37/39	Wear suitable protective clothing, gloves and eye/face protection.
S36/39	Wear suitable protective clothing and eye/face protection.
S37/39	Wear suitable gloves and eye/face protection.
S47/49	Keep only in the original container at temperature not exceeding… ^{o}C (to be specified by the manufacturer).

There are no safety phrases S10, S11, S19, S31 or S32 in accordance with the National Code of Practice for the Labelling of Workplace Substances [NOHSC:2012(1994)][4].

The combination safety phrases do not appear in the Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2004)][5]. They are sourced from Commission Directive 2001/59/EC of 6 August 2001[12].

***** Safety phrases S1 and S2 are shown in brackets in HSIS. When the substance or preparation is sold for industrial use only, S1 and S2 can be omitted from the label.

Appendix 3: Example of classifying a mixture

Example 1: A mixture containing 2% propylene imine

Step 1 The only hazardous ingredient present in the mixture is propylene imine. The health hazard cut-off data for propylene imine [or 2-methylaziridine] are as follows:

Name	CAS No	Cut-Offs
propylene imine [2-methylaziridine]	75-55-8	Conc>=10%: T+; R45; R26/27/28; R41 >=7%Conc<10%: T+; R45; R26/27/28; R36 >=5%Conc<7%: T; R45; R23/24/25; R36 >=1%Conc<5%: T; R45; R23/24/25 >=0.1%Conc<1%: T; R45; R20/21/22 >=0.01%Conc<0.1%: T; R45

Step 2 The 2% concentration is above the lowest concentration cut-off level for propylene imine (that is, 0.01%), so the mixture is determined to be hazardous.

Step 3 The relevant line from the cut-off column:
>=1%Conc<5%: T; R45; R23/24/25, is inserted into the table.

Step 4 Since there is only one ingredient, no further entries are needed.

Step 5 The hazard category is Toxic, R45; R23/24/25.

Step 6 Since there is only one hazardous substance in the mixture no further classification is necessary.

Note: R11 (which is found in the “Classification” column for propylene imine) is a physicochemical risk phrase. Such risk phrases are given in the HSIS for completeness as they have been assigned in the European listing of classifications. Readers should refer to state and territory Dangerous Goods legislation for criteria for identification of physicochemical hazards.

Appendix 4: Reference Documents

1. National Occupational Health and Safety Commission, 'National Model Regulations for the Control of Workplace Hazardous Substances' [NOHSC:1005(1994)], in *Control of Workplace Hazardous Substances: National Model Regulations and National Code of Practice*, AusInfo, Canberra, 1994.
2. National Occupational Health and Safety Commission, 'National Code of Practice for the Control of Workplace Hazardous Substances' [NOHSC:2007(1994)], in Control of Workplace Hazardous Substances: National Model Regulations and National Code of Practice, AusInfo, Canberra, 1994.
3. National Occupational Health and Safety Commission, National Code of Practice for the Preparation of Material Safety Data Sheets, 2nd Edition [NOHSC:2011(2003)], National Occupational Health and Safety Commission, Canberra, 2003.
4. National Occupational Health and Safety Commission, National Code of Practice for the Labelling of Workplace Substances [NOHSC:2012(1994)], AusInfo, Canberra, 1994.
5. National Occupational Health and Safety Commission, Approved Criteria for Classifying Hazardous Substances, [NOHSC:1008(2004)] 3rd Edition, National Occupational Health and Safety Commission, Canberra, 2004.
6. National Occupational Health and Safety Commission, National Model Regulations for the Control of Workplace Hazardous Substances Part 2–Scheduled Carcinogenic Substances [NOHSC:1011(1995)], AusInfo, Canberra, 1995.
7. National Occupational Health and Safety Commission, 'Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment' [NOHSC:1003(1995)], in Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards, AusInfo, Canberra, 1995.
8. National Occupational Health and Safety Commission, Guidance Note for the Assessment of Health Risks Arising from the Use of Hazardous Substances in the Workplace [NOHSC:3017(1994)], AusInfo, Canberra, 1994.
9. National Occupational Health and Safety Commission, Guidance Note for the Control of Workplace Hazardous Substances in the Retail Sector [NOHSC:3018(1994)], AusInfo, Canberra, 1994.
10. EEC Council Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances, Official Journal of the European Communities, No. L196 (16 August 1967).
11. Directive 1999/45/EC of the European Parliament and of the Council concerning the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous preparations, Official Journal of the European Communities, No. L200 (31 May 1999).
12. Commission Directive 2001/59/EC of 6 August 2001 adapting to technical progress for the 28th time Council Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances, Official Journal of the European Communities, No. L225 (21 August 2001).

13. Commission Directive 2001/60/EC adapting to technical progress Directive 1999/45/EC of the European Parliament and of the Council concerning the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous preparations, Official Journal of the European Communities, No. L226 (22 August 2001).

14. National Occupational Health and Safety Commission, List of Designated Hazardous Substances [NOHSC:10005(1994)], AusInfo, Canberra, 1994.

15. National Occupational Health and Safety Commission, List of Designated Hazardous Substances, 2nd Edition [NOHSC:10005(1999)], AusInfo, Canberra, 1999.

16. Commission Directive 96/54/EC of 30 July 1996 adapting to technical progress for the twenty-second time Council Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances, Official Journal of the European Communities, No. L248/1 (30 September 1996).

17. Federal Office of Road Safety, Australian Code for the Transport of Dangerous Goods by Road and Rail, 6th Edition, AusInfo, Canberra, September 1998. [and as updated from time to time]