



Pressure equipment—Hazard levels



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Australian Standard[®]

Pressure equipment—Hazard levels

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee ME-001, Pressure Equipment, to supersede AS 4343—2005.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this revision is to include improvements suggested by users of this Standard.

Significant changes are as follows:

- (a) Adoption of the numerical method of calculating hazard level. This has been done to remove the inconsistencies that arise when calculating modified PV values and remove the unneeded conservatism in the hazard level.
- (b) Clarification of parameters used to calculate hazard levels—removal of some inconsistency between design and operating parameters.
- (c) Revision of fluid criteria to remove anomalies and remove contradictory requirements in the Standard.
- (d) Identifying the role of purchasers and owners in determining hazard levels.

In determining and allocating the hazard level values, input has been received from regulatory authorities and users, and the practices adopted in industrialized countries and those in the European Union Pressure Equipment Directive have been taken into account.

The impact of this revision is expected to be negligible, except to resolve a number of issues raised in the use of the Standard, and to facilitate its use. Specifically, the adoption of the calculation method for determining hazard level simplifies and enhances the automation of hazard level calculation.

The basis for hazard level in this Standard is the maximum amount of stored energy that could be released in 5–10 seconds and the level of exposure. For boilers and pressure vessels, calculation involves pressure and volume, while for piping, pressure and diameter are used similarly to that in EU-PED for ease of use.

Changes introduced in this edition do not require alteration to hazard level of existing pressure equipment determined in accordance with the previous edition of AS 4343.

The use (or implementation) of this Standard is subject to the requirements of the applicable regulator, for example, in some States and Territories the superseded Standard may apply until regulations are amended.

The term ‘normative’ has been used in this Standard to define the application of the appendix to which it applies. A ‘normative’ appendix is an integral part of a Standard.

Statements expressed in mandatory terms in Notes to Tables are deemed to be requirements of this Standard.

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STANDARDS AUSTRALIA

Australian Standard
Pressure equipment—Hazard levels

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies criteria for determining the hazard levels of various types of pressure equipment to AS/NZS 1200. It also classifies fluids for use with pressure equipment.

1.2 OBJECTIVE

This Standard is intended to provide a uniform, practical, generic system for assessing the level of hazard associated with various pressure equipment, that is, the potential to harm people, or damage property and the environment, as a consequence of pressure equipment loss of containment by rupture, serious leakage or collapse.

These hazard levels may be used for a number of purposes, including—

- (a) selecting the appropriate levels of control for safety purposes and risk management;
- (b) providing a basis for registration of boilers and pressure vessels and their design with authorities; and
- (c) providing a basis for in-service inspection of pressure equipment.

1.3 APPLICATION

This Standard is intended to be used in the design, manufacture, inspection, conformity assessment, use and ultimate disposal of pressure equipment.

This Standard is not intended to apply to gas cylinders. For further information, see AS 2030 series and ADG Code.

The controls at each of the above phases should be proportionate to the hazard that the equipment presents to provide an overall acceptable level of risk to the community.

This Standard uses the main characteristics of pressure equipment hazards to determine the hazard level. In certain cases, the hazard levels determined by this Standard might need to be increased based on sound engineering rationale.

NOTE: State and Territory regulations usually reference this Standard and may require design registration for boilers and pressure vessels of hazard levels A, B, C and D and item registration of such equipment with hazard levels A, B or C (see relevant State and Territory regulations for pressure equipment).

The hazard level should be recorded on the equipment and the associated documentation.

The purchaser shall supply the necessary information so as to allow the appropriate hazard level to be determined.

Where there is a fundamental change in design condition, such as the design pressure or the location of the pressure equipment, the hazard level shall be reviewed and the classification shall either be reaffirmed or changed accordingly.

1.4 REFERENCED DOCUMENTS

The documents referred to in this Standard are listed in Appendix A.

1.5 DEFINITIONS

For the purposes of this Standard, the definitions given in AS 4942 and the following apply.

1.5.1 Hazard level

Categorization of pressure equipment into one of five groups (A, B, C, D, E) that have similar potentials to cause harm to persons, property and the environment, based on fluid contents, design parameters and working environment.

1.5.2 Pressure equipment

Boilers, pressure vessels and pressure piping as defined in AS/NZS 1200.

SECTION 2 HAZARD LEVELS OF PRESSURE EQUIPMENT

2.1 HAZARD LEVELS

2.1.1 Typical hazard levels

Typical examples of hazard levels A, B, C, D and E are as follows:

- (a) Hazard level A (high hazard)—applies to large vessels, (e.g. 4000 tonne ethane vessels, 7000 tonne butane or propane vessels, 25 000 tonne ammonia vessels, 200 tonne chlorine vessels and large power boilers) and also some vessels containing quantities above the threshold quantities for major hazard facilities as listed in Table 3.1.
- (b) Hazard level B (medium hazard)—applies to most shop fabricated boilers and pressure vessels.
- (c) Hazard levels C and D (low and extra low hazards, respectively)—apply to small pressure equipment or equipment with low hazard contents (e.g. small air receivers).
- (d) Hazard level E (negligible hazard)—covers all negligible-hazard pressure equipment not classified in hazard levels A, B, C and D. This equipment is usually exempt from special regulatory control but is covered by general plant safety regulations.

2.1.2 Determining hazard level

The hazard levels A, B, C, D and E of various types of pressure equipment shall be determined from Equation 2.1 or Appendix B using the following procedure or equivalent:

- (a) Identify the values of—
 - (i) P —the design pressure, in megapascals;
 - (ii) V —(for all equipment except piping) the volume, in litres; and
 - (iii) D —(for piping only) the nominal pipe diameter, in millimetres.

NOTE: D is used to calculate PD , see Clauses 2.2.5 and 2.2.6.
- (b) Identify the contents of the equipment, and whether they will be gas or liquid (see Clauses 2.2.2, 2.2.3 and 3.2). Use this information to determine compressibility and mass factor (F_c) in Equation 2.1.
- (c) Determine the fluid type of the contents using Section 3 and Table 3.1. Use this information to determine contents factor (F_f) in Equation 2.1.
- (d) Review Clauses 2.2.6 to 2.2.9 and 2.2.11 to 2.2.13 to determine any location or service level factor (F_s) applicable.

For pressure vessels and boilers the preferred method for determining hazard levels is the numerical method using Equation 2.1.

For pressure piping and a conservative method for determining hazard levels of other pressure equipment, the tabular method provided in Appendix B may be used.

2.2 NUMERICAL METHOD OF DETERMINING HAZARD LEVELS

2.2.1 Method

The hazard level value (H) shall be calculated from Equation 2.1 (see Clause 2.1.2) and using relevant clauses from Clause 2.2.2 to 2.2.6.

$$H = PVF_c F_f F_s \quad \dots 2.1$$

where

- H = hazard level value, in megapascal litres
- P = design pressure, in megapascals
- V = volume (see Clause 2.2.4), in litres
- F_c = compressibility and mass factor (see Clause 2.2.2)
- = 0.1 for vacuum
 - = 1 for liquid
 - = 10 for gas
- F_f = contents (fluid) factor (see Clause 2.2.2)
- = 1/3 for non-harmful liquids (except as provided in Clause 2.2.6)
 - = 1.0 for non-harmful gas
 - = 3 for harmful liquid or gas
 - = 10 for very harmful liquid or gas
 - = 1000 for lethal liquid or gas
- F_s = location or service factor
- = 1 unless one of the following conditions apply
 - = 3 for one of the conditions in Clause 2.2.5(a)
 - = 10 for more than one of the conditions in Clause 2.2.5(a)
 - = 30 for $P > 50$ MPa [see Clause 2.2.5(b)]
 - = 1/3 for one of the conditions in Clause 2.2.5(c)
 - = 1/10 for more than one of the conditions in Clause 2.2.5(c)
 - = 3 for human occupancy vessels [see Clause 2.2.5(a)]

2.2.2 Terms relating to contents

The classification of contents into the four groups in this Clause (2.2.2) applies specifically for this Standard and is based on the ADG Code (for dangerous goods), Model Work Health and Safety Regulations, Safe Work Australia and NOHSC:1008. Terms used by these references are shown in italics. The expected concentrations referenced as follows are for the contents of the pressure equipment:

- (a) *Lethal contents (LG/LL)*—containing a very toxic substance or highly radioactive substance which, under design concentration and operating conditions, is capable on leakage of causing death or serious irreversible harm to persons from a single short-term exposure to a very small amount of the substance by inhalation or contact, even when prompt restorative measures are taken. Examples of such substances are acrolein, chloropicrin, and other substances with an exposure limit usually ≤ 0.1 ppm by volume (or equivalent) to NOHSC:1003 or other relevant Standard.
- (b) *Very harmful contents (VHG/VHL)*—containing a substance which, under design concentration and operating conditions, is classified as extremely or highly flammable, very toxic, toxic, harmful, oxidizing, explosive, self-reactive, corrosive, or harmful to human tissue, but excluding lethal contents.

- (c) *Harmful contents (HG/HL)*—containing a substance which, under design concentration and operating conditions, is classified as a combustible liquid or fluid irritant to humans, or is harmful to the environment, the contents above 90°C, or below –30°C, but excluding lethal or very harmful fluids.
- (d) *Non-harmful contents (NHG/NHL)*—containing substances which are not covered by lethal, very harmful or harmful, that is normally not harmful, except for pressure effects and concentration effects (e.g. oxygen depletion).

For mixed contents, the harmfulness of the mixture may be determined from the criteria specified in NOHSC:1008 (e.g. a mixture of 5% cyanide in water would not be classified as lethal).

2.2.3 Terms relating to fluids

Where a substance meets more than one of the following descriptions, it shall be treated as that resulting in the most severe requirement:

- (a) *Substance*—includes gas, liquid, solid or mixture. A fluid is a gas, liquid or mixture; it may contain entrained solids, e.g. slurries and fluidized solids.
- (b) *Harmful to human tissue*—describes a substance which is capable of harming the skin, eyes or exposed mucous membrane so that irreversible damage may be done unless prompt restorative measures are taken, including flushing with water, use of antidotes or medicines. It includes oxidizing, radioactive and corrosive fluids.
- (c) *Flammable gas*—dangerous goods of Class 2.1 of the ADG Code (i.e. a gas capable of being ignited and burned in air at atmospheric pressure).
- (d) *Flammable liquid*—dangerous goods of Class 3 of the ADG Code (i.e. generally with a flashpoint not greater than 61°C, or a liquid at a service temperature at or above its flashpoint).
- (e) *Combustible liquid*—a liquid capable of burning but with a flashpoint above 61°C or at a service temperature below its flashpoint.
- (f) *Gas*—see Clause 3.2.4.
- (g) *Liquid*—see Clause 3.2.5.
- (h) *Oxidizing substance*—dangerous goods of Class 5 of the ADG Code.
- (i) *Irritant*—substance capable or likely to cause temporary discomfort, but unlikely to cause permanent injury or illness. This includes Class 2 or 6.1 substances at concentrations which are not hazardous to humans, and also skin sensitizing substances.
- (j) *Toxic (or poisonous) substance*—dangerous goods of Class 2.3 or 6 of the ADG Code (e.g. chlorine, anhydrous ammonia or infectious substances). Also includes some carcinogenic, mutagenic and teratogenic substances in accordance with NOHSC:1008.
- (k) *Very toxic substance*—a toxic substance classified by NOHSC:1008 as very toxic.
- (l) *Radioactive substance*—dangerous goods of Class 7 of the ADG Code.
- (m) *Corrosive substance*—dangerous goods of Class 8 of the ADG Code.

2.2.4 Volume to be used in PV calculations

The volume (V) to be used in calculating PV values shall be net internal volume, in litres, as follows:

- (a) *General vessels*—use volume of vessel (i.e. volume which can be filled with fluid under pressure).
- (b) *Multi-chamber vessels*—
 - (i) chambers normally open to each other, treat as one vessel, i.e. use total volume; or
 - (ii) chambers normally isolated, treat as separate vessels.
- (c) *Vessel containing fluid in more than one phase (e.g. gas and liquid)*—assume the vessel is full of gas if liquid is above its atmospheric pressure boiling point, otherwise select greater hazard based on maximum volume of liquid or gas.
- (d) *Open container with pressurized jacket*—use volume of jacket.
- (e) *Coil or similar type heater/cooler*—use the total volume or, if desired, the tubular portion may be regarded as a pipe with diameter equal to the tube diameter.
- (f) *Boilers*—use the volume of pressurized fluid in the shell or largest drum. If the boiler has no shell or drum, use the diameter D of the largest tube to determine hazard level as for a pipe.
- (g) *Shell and tube heat exchangers*—calculate the volumes (and relevant hazard levels) of the shell and tube/plenums separately.
- (h) *Refrigeration and air conditioning systems*—treat each vessel and tubing separately as in Item (f) above.

2.2.5 Modifications to values of PV or PD for special conditions

The calculated value of PV or PD shall be multiplied as follows:

- (a) By a factor of 3 when one of the following conditions apply, or by a factor of 10 when two or more of the conditions apply (for piping the factors are 1.5 and 2, respectively):
 - (i) Fired equipment heated by the products of combustion, electric heating and highly focussed solar heating (e.g. pressurized hot water heater, fired oil heater) but not equipment heated by steam, air, hot water or microwave.
Factor is not required when using Table B1 to calculate the hazard level as it is already incorporated in the tabular values.
 - (ii) Equipment fitted with quick-actuating closures or doors, except for vacuum vessels.
 - (iii) Equipment sited in a facility which comes under the control of the major hazard facility legislation, except where a risk assessment establishes that a higher hazard level should be adopted for the equipment.
 - (iv) Road tankers and transportable vessels when transporting their contents under pressure with volumes greater than 200 L. Conditions (a)(i) to (iii) are not intended to apply additionally.
 - (v) For pressure vessels intended for human occupancy and with a design pressure in excess of 0.01 MPa, and non-harmful gas. Conditions (a)(i) to (iii) are not intended to apply additionally.
- (b) By a factor of 30 for pressure vessels (5 for piping) with design pressure exceeding 50 MPa.

- (c) By a factor of 1/3 when one of the following conditions (i) to (iii) apply, or by a factor of 1/10 when two or more items apply (these factors do not apply to fired boilers), and for piping the factors are 1/1.5 and 1/2 respectively:
- (i) Equipment is located in an area where employees are not permanently stationed but may periodically visit for servicing and the like, and which is remote from other buildings, processes or persons.
 - (ii) Piping is buried or is covered in trenches, or pressure vessels are sufficiently safeguarded (e.g. purpose built bunkers).
 - (iii) Maximum membrane stress for vessels and piping based on corroded thickness does not exceed 50 MPa, 20% of specified minimum yield stress at design temperature, or 50% of permissible design strength (f), whichever is less.

NOTE: Suppliers, owners or users (as the case may be) of pressure equipment installed on major hazard facility sites should ensure that the relevant modification factor has been applied by the designer. A retrospective application of this factor may necessitate the registration of plant design and/or registration of item of plant of the particular equipment be completed with the relevant WHS authority.

2.2.6 *PV* and *PD* limits

Pressure equipment with $PV < 100\,000$ MPa.L or $PD < 2300$ MPa.mm (before multiplying factors are applied) with non-harmful liquid at a temperature above 0°C but not exceeding 65°C shall be classified as hazard level E.

2.2.7 Combined conditions

All three conditions of volume or diameter, pressure and the product PV or PD shall be met before a hazard level is determined except for the conditions given in Clauses 2.2.10, 2.2.11 and 2.2.12.

2.2.8 Hazard level *PV* and *PD* limits

If the product $P \times V$ or $P \times D$ equals the value of boundary between two categories, then the lower category shall apply.

2.2.9 Multiple hazard levels

Where pressure equipment can be classified into more than one hazard level (e.g. multi-chamber vessels, shell and tube heat exchangers), the higher hazard level shall be selected.

2.2.10 Applicability

All pressure vessels which fall above the application curves in AS 1210, should be classified in accordance with this Standard. The hazard level for pressure vessels having a design pressure not exceeding 0.05 MPa (or 0.05 MPa vacuum for vacuum vessels), but which have a pressure–diameter relationship above the application curves in AS 1210 shall be determined using a PV value equal to 0.3 times (0.1 times for vacuum vessels) the actual PV of the vessel).

2.2.11 Lethal gas

For pressure vessels with lethal gas (Item 1.1 of Table B1, Appendix B) hazard level D shall apply where $PV \leq 0.1$ MPa.L.

2.2.12 Pressure piping

For pressure piping, where $D \leq$ the nominal size in Column 3, Items 5.1 to 5.4 of Table B1, Appendix B and $P > 10$ MPa, then the hazard level shall be selected for the appropriate contents and value of PD .

Piping from pressure equipment up to their first point of flange or point of isolation from the outside diameter of pressure equipment (whichever is the lesser) shall take the most severe hazard level of the pressure equipment or the piping.

Where two items of pressure equipment are designed to different design Standards (e.g. pressure vessels and attached piping), the change of hazard level shall occur at the change of scope of the design Standard.

2.2.13 Determine hazard level from hazard level value

The hazard level shall be determined from the hazard level value (see Equation 2.1) as given in Table 2.1.

TABLE 2.1
HAZARD LEVEL

Hazard level value (H)	Hazard level
$<10^{2.5}$	E
$\geq 10^{2.5}$ to $<10^3$	D
$\geq 10^3$ to $<10^4$	C
$\geq 10^4$ to $<10^{8.5}$	B
$>10^{8.5}$	A

NOTE: One hazard level (H) is approximately equal to 1 kJ equivalent energy or 0.001 kg of TNT.

SECTION 3 FLUID TYPES AND CLASSES

3.1 GENERAL

Table 3.1 lists the fluid types from this Standard and the fluid class from the ADG Code, for various fluids conveyed or contained in pressure equipment.

This information is intended to assist designers, manufacturers, users and others in calculating hazard levels and using the following documents:

- (a) AS 1210, AS 1228, AS 3059, AS 4041, AS 4458, AS/NZS 3788 and AS 3920, that specify design, fabrication and test requirements for different fluid types.
- (b) State and Territory regulations for pressure equipment, which may adopt hazard levels of this Standard.
- (c) ADG Code, which specifies requirements for land transport of dangerous goods and classifies these goods.
- (d) Model Work Health and Safety Regulations, Safe Work Australia and NOHSC:2007.
- (e) NOHSC:1014 and NOHSC:2016.

NOTE: If a fluid is not listed in Table 3.1, see Table 3.2 and relevant material safety data sheet (MSDS) to determine fluid type.

3.2 USE OF TABLE 3.1

3.2.1 Column 1

Column 1 identifies the fluid by the United Nation number (UN) listed in the ADG Code.

3.2.2 Column 2

Column 2 alphabetically lists the name of gases and liquids as in the ADG Code and also some substances piped as solutions or fluidized substances (e.g. slurries in liquids or powder in air or other gases).

3.2.3 Columns 3 and 4

Columns 3 and 4 identify type and class (see Table 3.2 for basis).

3.2.4 Gas

For this Standard, gas is any Class 2 dangerous good as specified in ADG Code, (i.e. completely gaseous at 20°C and 101.3 kPa absolute or at 50°C has a vapour pressure greater than 300 kPa absolute). Gas includes the following:

- (a) Compressed gas which is entirely gaseous at 20°C and 101.3 kPa absolute.
- (b) Liquefied gas which is partially liquid at 20°C.
- (c) Refrigerated liquefied gas which is partially liquid because of its low temperature.
- (d) Gas in solution which is a compressed gas dissolved in a solvent.
- (e) Any liquid when it is above its atmospheric pressure boiling point, e.g. pressurized high-temperature water which flashes to steam on release of pressure.
- (f) Fluidized liquids or solids in compressed air or other gas.

3.2.5 Liquid

For this Standard, liquid is any substance at a temperature below its atmospheric pressure boiling point (e.g. water <100°C). Liquid also includes solids fluidized in liquids (e.g. slurries). For the ADG Code, liquid is any substance with melting point $\leq 20^{\circ}\text{C}$ at 101.3 kPa absolute and which is not a gas.

3.2.6 Change of fluid type for design temperature

For this Standard, the fluid type changes depending on the design temperature as follows:

- (a) Above 90°C or below -30°C , the fluid type listed in Table 3.1 is changed from non-harmful gas to harmful gas, and from non-harmful liquid to harmful liquid. Air is an exception to the above, and this range is increased to 120°C as a result of the cooling provided by the Joule-Thompson effect, reducing temperature hazard to personnel.
- (b) Above their atmospheric pressure boiling point, liquids are treated as gas.
- (c) Above their flashpoint, liquids are treated as flammable gas.

3.2.7 Change of fluid type for mixture and different concentrations

For change of fluid type for mixture and different concentrations at the time and location of release from pipe or equipment, see ADG Code or Hazardous Substances Information System, Safe Work Australia.

3.2.8 Change of fluid type for pressure

For non-toxic, non-flammable gas (ADG Code Class 2.2) at pressure ≤ 300 kPa treat as non-harmful gas.

3.3 BASIS OF FLUID TYPES

Fluids in Table 3.1 have been allocated a 'fluid type' number or letters on the following basis:

- (a) Assumes 100% concentration unless noted otherwise.
- (b) Alignment with the class system of the ADG Code, except where temperature, concentration, or pressure necessitate modification (see Clauses 3.2.6, 3.2.7 and 3.2.8).
- (c) Alignment with NOHSC:1003, NOHSC:1008 and Hazardous Substances Information System, Safe Work Australia.

This classification is intended to assist in determining hazards affecting—

- (i) health and safety of persons by inhalation, ingestion, skin or eye contact, primarily with short-term exposure; and
- (ii) person, property and environment by blast, flammability, corrosion, contamination and the like.

NOTE: Corrosion effect on pressure equipment material is assumed minor, as design is required to cater for these effects.

TABLE 3.1
FLUID—NAME, TYPE AND CLASS
 (see Clause 3.2.6 for effect of temperature;
 see Clause 3.2.7 for effect of mixtures and concentration)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
1088	Acetal	VHL	3	
1089	Acetaldehyde	VHL	3	
2789	Acetic Acid, glacial or Acetic acid solution 80%	VHL	8	
2790	Acetic Acid solution 10%–80%	VHL	8	
1715	Acetic Anhydride	VHL	8	
1090	Acetone	BP 57°C VHL	3	
1541	Acetone Cyanohydrin, stabilized	VHL	6.1(a)	200
1091	Acetone oils	VHL	3	
1716	Acetyl Bromide	BP 81°C VHL	8	
1717	Acetyl Chloride	BP 51°C VHL	3-8	
1001	Acetylene, dissolved	D 0.91 VHG	2.1	50
1898	Acetyl Iodide	VHL	8	
2621	Acetyl Methyl Carbinol	VHL	3	
2607	Acrolein Dimer, stabilized	VHL	3	
1092	Acrolein, inhibited	BP 52°C LL	6.1(a)-3	200
2218	Acrylic Acid inhibited	VHL	8	
1093	Acrylonitrile, inhibited	VHL	3-6.1(a)	200
1133	Adhesives containing flammable liquid	VHL	3	
2205	Adiponitrile	BP 93°C VHL	6.1(b)	
1002	Air, compressed	<90°C NHG	2.2	
	Joule-Thompson effect reduced leak harm risk	90°C <120°C NHG		
		>120°C HG		
1003	Air, refrigerated liquid	VHG	2.2-5.1	
3065	Alcoholic Beverages >24% alcohol	VHL	3	
	Alcoholic Beverages ≤24% alcohol	NHL		
1987	Alcohols +	VHL	3	
1986	Alcohols, toxic +	VHL	3-6.1(a) or (b)	
1421	Alkali Metal Alloys, liquid +	VHL	4.3	
3140	Alkaloids liquid +	VHL	6.1	
2735	Alkylamines + or Polyalkylamines +, corrosive	VHL	8	
2734	Alkylamines + or Polyalkylamines +, corrosive, flammable	VHL	8-3	
3145	Alkyl Phenols, liquid+	VHL	6.1(b)	
2333	Allyl Acetate	VHL	3-6.1(a)	
1098	Allyl Alcohol	VHL	6.1(a)-3	20
2334	Allylamine	BP 55°C VHL	6.1(a)-3	200

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
1100	Allyl Chloride	BP 44°C	VHL	3-6.1(a)
1722	Allyl Chloroformate		VHL	8
2335	Allyl Ethyl Ether		VHL	3-6.1(a)
2336	Allyl Formate		VHL	3-6.1(a)
2219	Allyl Glycidyl Ether		VHL	3-6.1(b)
1723	Allyl Iodide		VHL	3-8
1545	Allyl Isothiocyanate, inhibited		VHL	6.1(a)
1724	Allyl Trichlorosilane, stabilized		VHL	8
3052	Aluminium Alkyl Halides		VHL	4.2
3076	Aluminium Alkyl Hydrides		VHL	4.2
3051	Aluminium Alkyls		VHL	4.2
2580	Aluminium Bromide solution		VHL	8
2581	Aluminium Chloride solution		VHL	8
2946	2-Amino-5-Diethylamino Pentane		VHL	6.1(b)
1005	Ammonia, Anhydrous, liquefied or Ammonia solutions >50%		VHG	2.3-8
2073	Ammonia solutions 35%–50%		VHG	2.2
2817	Ammonium Hydrogen Fluoride solution		VHL	8-6.1
2426	Ammonium Nitrate liquid (hot concentrated solution)		VHL	5.1
2818	Ammonium Polysulfide solution		VHL	8-6.1
2683	Ammonium Sulphide solution		VHL	8-3-6.1
1104	Amyl Acetates		VHL	3
2819	Amyl Acid Phosphate		VHL	8
1105	Amyl Alcohols		VHL	3
1106	Amylamine		VHL	3
2620	Amyl Butyrates		VHL	3
1107	Amyl Chloride		VHL	3
1108	n-Amylene		VHL	3
1109	Amyl Formates		VHL	3
1111	Amyl Mercaptan		VHL	3
1110	Amyl Methyl Ketone		VHL	3
1112	Amyl Nitrate		VHL	3
1728	Amyl Trichlorosilane		VHL	8
1547	Aniline (Anifine oil)		VHL	6.1(a)
1548	Aniline Hydrochloride		VHL	6.1(b)
2222	Anisole		VHL	3
1730	Antimony Pentachloride, liquid		VHL	8
1731	Antimony Pentachloride, solution		VHL	8
1732	Antimony Pentafluoride		VHL	8-6.1(a)
1006	Argon, compressed		NHG	2.2

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
1951	Argon, refrigerated liquid	HG	2.2	
1553	Arsenic Acid, liquid	VHL	6.1(a)	
1556	Arsenic Compounds, liquid+	VHL	6.1(a) or (b)	10
1559	Arsenic Pentoxide	VHL	6.1(a) or (b)	10
1560	Arsenic Trichloride	VHL	6.1(a)	0.1
1561	Arsenic Trioxide	VHL	6.1(a)	0.1
2188	Arsine	LG	2.3-2.1	
2796	Battery Fluid, acid	VHL	8	
2797	Battery Fluid, alkali	VHL	8	
1114	Benzene	VHL	3	
2225	Benzene Sulfonyl Chloride	VHL	8	
2224	Benzonitrile	VHL	6.1(a)	
2226	Benzotrachloride	VHL	8	
2338	Benzotrifluoride	VHL	3	
1736	Benzoyl Chloride	VHL	8	
1737	Benzyl Bromide	VHL	6.1(a)-8	
1738	Benzyl Chloride	VHL	6.1(a)-8	
1739	Benzyl Chloroformate	VHL	8	
2619	Benzyl Dimethylamine	VHL	8	
1886	Benzylidene Chloride	VHL	6.1(a)	
2653	Benzyl Iodide	VHL	6.1(a)	
...	Beverages (excluding alcoholic beverages with >24% alcohol)	NHL	—	
2693	Bisulfites, inorganic, aqueous solutions	VHL	8	
2692	Boron Tribromide	VHL	8	
1741	Boron Trichloride	D >1 VHG	2.3-8	
1008	Boron Trifluoride	D 2.35 VHG	2.3	
2604	Boron Trifluoride Diethyletherate	VHL	8-3	
2851	Boron Trifluoride Dihydrate	VHL	8	
2965	Boron Trifluoride Dimethyl Etherate	VHL	4.3-3-8	100
1118	Brake Fluid, hydraulic	VHL	3	100
1744	Bromine or Bromine solutions	BP 59°C VHL	8-6.1(a)	100
2901	Bromine Chloride	VHG	2.3-5.1-8	100
1745	Bromine Pentafluoride	BP 40°C VHL	5.1-6.1(a)-8	100
1938	Bromoacetic Acid	VHL	8	
1569	Bromoacetone	VHL	6.1(a)	
2513	Bromoacetyl Bromide	BP 150°C VHL	8	
2514	Bromobenzene	VHL	3	
2339	2-Bromobutane	VHL	3	
1887	Bromochloromethane	BP 58°C VHL	6.1(b)	

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
2688	1-Bromo-3-Chloropropane	VHL	6.1(b)	
2340	2-Bromoethyl Ethyl Ether	VHL	3	
2341	1-Bromo-3-Methyl Butane	VHL	3	
2342	Bromoethyl Propanes	VHL	3	
2343	2-Bromopentane	VHL	3	
2344	Bromopropanes	VHL	3	
2345	3-Bromopropyne	VHL	3	
2419	Bromotrifluoro Ethylene	D 5.60 VHG	2.1	
1009	Bromotrifluoro Methane	D 5.20 HG	2.2	
1010	Butadienes, inhibited	D 1.85 VHG	2.1	
1011	Butane or Butane mixtures	VHG	2.1	
2346	Butanedione	VHL	3	
1120	Butanols	VHL	3	
2708	Butoxyl	VHL	3	
1123	Butyl Acetates	VHL	3	
1718	Butyl Acid Phosphate	VHL	8	
2348	Butyl Acrylate	VHL	3	
1125	n-Butylamine	VHL	3	
2738	N-Butylaniline	VHL	6.1(a)	
1126	n-Butyl Bromide	VHL	3	
2747	tert-Butyl Cyclohexyl Chloroformate	VHL	6.1(b)	
1012	Butylene	VHG	2.1	
3022	1,2-Butylene Oxide, stabilized	VHL	3	
1128	n-Butyl Formate	VHL	3	
2485	n-Butyl Isocyanate	VHL	3-6.1(a)	
2347	Butyl Mercaptan	VHL	3	
2227	n-Butyl Methacrylate	VHL	3	
2350	Butyl Methyl Ether	BP 70°C VHL	3	
2351	Butyl Nitrites	VHL	3	
2228	Butylphenols, liquid	VHL	6.1(b)	
1914	Butyl Propionate	VHL	3	
2667	Butyltoluenes	VHL	6.1(b)	
1747	Butyl Trichlorosiline	VHL	8	
2352	Butyl Vinyl Ether, inhibited	VHL	3	
1129	Butyraldehyde	VHL	3	
2840	Butyraldoxime	VHL	3	
2820	Butyric Acid	VHL	8	
2739	Butyric Anhydride	VHL	8	
2411	Butyrontrile	VHL	3-6.1(a)	

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)	
2353	Butyryl Chloride	VHL	3-8		
2570	Cadmium Compounds (dust or oxide)	LL	6.1		
2681	Caesium Hydroxide solution	VHL	8		
2429	Calcium Chlorate, Aqueous solution	VHL	5.1		
1130	Camphor Oil	VHL	3		
2829	Caproic Acid	VHL	8		
1013	Carbon Dioxide	D 1.50	NHG	2.2	
1041	Carbon Dioxide with >6% Ethylene Oxide		VHG	2.3-2.1	
1015	Carbon Dioxide with Nitrous oxide	D 1.50	NHG	2.2	
1014	Carbon Dioxide and Oxygen Mixtures		NHG	2.2	
2187	Carbon Dioxide, Refrigerated liquid		HG	2.2	
1845	Carbon Dioxide, Solid (Dry Ice)		HG	9	
1131	Carbon Disulfide	BP 46°C	VHL	3-6.1(a)	200
1016	Carbon Monoxide	D 0.97	VHG	2.3-2.1	200
2600	Carbon Monoxide with Hydrogen	D 0.50	VHG	2.3-2.1	200
1846	Carbon Tetrachloride		VHL	6.1(a)	
2417	Carbonyl Fluoride	D 2.30	VHG	2.3	
2204	Carbonyl Sulfide	D 2.10	VHG	2.3-2.1	
1719	Caustic Alkali liquid+		VHL	8	
1017	Chlorine	D 2.40	VHG	2.3-5.1	25
2548	Chlorine Pentafluoride		VHG	2.3-5.1-8	25
1749	Chlorine Trifluoride	D 3.20	VHG	2.3-5.1-8	25
2232	Chloroacetaldehyde		VHL	6.1(a)	
3250	Chloroacetic Acid, molten		VHL	6.1(a)-8	
1750	Chloroacetic Acid, solution		VHL	6.1(a)-8	
1695	Chloroacetone, Stabilized (Tear Gas)		VHL	6.1(a)	
2668	Chloroacetonitrile		VHL	6.1(a)	
1697	Chloroacetophenone		VHL	6.1(a)	
1752	Chloroacetyl Chloride		VHL	8	
2019	Chloroanilines, liquid		VHL	6.1(a)	
1134	Chlorobenzene		VHL	3	
2234	Chlorobenzo Trifluorides		VHL	3	
1127	Chlorobutanes		VHL	3	
1888	Chloroform	BP 61°C	VHL	6.1(a)	
2745	Chloromethyl Chloroformate		VHL	6.1(a)-8	
2354	Chloromethylethyl Ether		VHL	3-6.1(a)	
2904	Chlorophenates, liquid		VHL	8	
2021	Chlorophenols, liquid		VHL	6.1(b)	
1753	Chlorophenyl Trichlorosilane		VHL	8	

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
1580	Chloropicrin	LL	6.1(a)	
1581	Chloropicrin and Methyl Bromide mixtures	VHL	2.3	
1582	Chloropicrin and Methyl Chloride mixtures	VHL	2.3	
1583	Chloropicrin mixtures+	VHL	6.1(a) or (b)	
1991	Chloroprene, inhibited	BP 59°C	VHL	3-6.1(a)
2356	2-Chloropropane	VHL	3	
2849	3-Chloropropanol-1	VHL	6.1(b)	
2456	2-Chloropropene	VHL	3	
2511	a-Chloropropionic Acid	VHL	8	
2822	2-Chloropyridine	VHL	6.1(a)	
2987	Chlorosilanes+	VHL	8	
2985	Chlorosilanes+	FP <23°C	VHL	3-8
2986	Chlorosilanes+ and corrosive	FP ≥23°C	VHL	8.3
2988	Chlorosilanes+ with water emit flammable gas	VHL	4.3-3-8	
1754	Chlorosulfonic Acid	VHL	8	
2238	Chlorotoluenes	VHL	3	
1983	1-Chloro-2,2,2-Trifluoroethane	D 4.10	NHG	2.2
1755	Chromic Acid solution	VHL	8	
1757	Chromic Fluoride solution	VHL	8	
1758	Chromium Oxychloride	VHL	8	
2240	Chromosulfuric Acid	VHL	8	
1023	Coal Gas	D 0.4-0.6	VHG	2.3-2.1
1136	Coal Tar Distillates, flammable	VHL	3	
1956	Compressed Gas+ (Non-flammable, non-toxic)	NHG	2.2	
1954	Compressed Gas, flammable+	VHG	2.1	
3156	Compressed Gas, oxidizing+	VHG	2.2-5.1	
1955	Compressed Gas, toxic+	VHG	2.3	
1760	Corrosive liquid+ (Non-flammable/toxic/oxidizing)	VHG	8	
2076	Cresols	VHL	6.1(a)	
2022	Cresylic Acid	VHL	6.1(a)	
1143	Crotonaldehyde, stabilized	VHL	3	
1144	Crotonylene	BP 28°C	VHL	3
1761	Cupriethylene Diamine, solution	VHL	8-6.1	
1935	Cyanide solutions (see Note 1 to Table 1)	VHL	6.1(a) or (b)	
1589	Cyanogen Chloride, inhibited	D 2.10	VHG	2.3
1026	Cyanogen, liquefied	VHG	2.3-2.1	
2601	Cyclobutane	VHG	2.1	
2744	Cyclobutyl Chloroformate	VHL	6.1(a)-8	
2518	1,5,9-Cyclo Dodecatriene	VHL	6.1(b)	

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
2241	Cycloheptane	VHL	3	
2603	Cycloheptatriene	VHL	3-6.1(a)	
2242	Cycloheptene	VHL	3	
1915	Cyclohexanone	VHL	3	
2256	Cyclohexene	VHL	3	
1762	Cyclohexenyl Trichlorosilane	VHL	8	
2243	Cyclohexyl Acetate	VHL	3	
2357	Cyclohexylamine	VHL	8-3	
2488	Cyclohexyl Isocyanate	VHL	6.1(a)	
3054	Cyclohexyl Mercaptan	VHL	3	
1763	Cyclohexyl Trichlorosilane	VHL	8	
2520	Cyclooctadienes	VHL	3	
2358	Cyclooctatetraene	VHL	3	
2244	Cyclopentanol	VHL	3	
2245	Cyclopentanone	VHL	3	
2246	Cyclopentene	BP 44°C VHL	3	
1027	Cyclopropane, liquefied	VHG	2.1	
2046	Cymenes	VHL	3	
1868	Decaborane	MP 100°C LL	4.1-6.1(a)	
1147	Decahydro Naphthalene	VHL	3	
2247	n-Decane	VHL	3	
1957	Deuterium	D 0.14 VHL	2.1	
1148	Diacetone Alcohol	VHL	3	
2359	Diallylamine	VHL	3	
2360	Diallyl Ether	VHL	3-6.1(a)	
2841	Di-n-Amylamine	VHL	6.1(b)	
2434	Dibenzylchloro Silane	VHL	8	
1911	Diborane	LG	2.3-2.1	
2711	Dibromobenzene	VHL	3	
2648	1,2-Dibromobutan-3-one	VHL	6.1(a)	
1941	Dibromodifluoro Methane	BP 24°C HL	9	
2664	Dibromomethane	VHL	6.1(b)	
2248	Di-n-Butylamine	VHL	8-3	
2873	Dibutylaminoethanol	VHL	6.1(b)	
1149	Dibutyl Ethers	VHL	3	
1764	Dichloroacetic Acid	VHL	8	
1765	Dichloroacetyl Chloride	VHL	8	
1591	o-Dichlorobenzene	VHL	6.1(b)	
1916	2,2-Dichlorodiethyl Ether	VHL	6.1(a)	

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
2249	Dichloro Dimethyl Ether, Symmetrical	LL	6.1(a)	
2362	1,1-Dichloroethane	VHL	3	
1150	Dichloroethylene	VHL	3	
2490	Dichloroisopropyl Ether	VHL	6.1(a)	
1593	Dichloromethane	VHL	6.1(b)	
2650	1,1-Dichloro-1-Nitro Ethane	VHL	6.1(a)	
1152	Dichloropentanes	VHL	3	
1766	Dichlorophenyl Trichlorosilane	VHL	8	
2750	1,3-Dichloro Propanol-2	VHL	6.1(a)	
2047	Dichloropropenes	VHL	3	
2189	Dichlorosilane	VHL	2.3-2.1-8	
1958	Dichlorotetra Fluoroethane	VHL	2.2	
2565	Dicyclohexylamine	VHL	8	
2372	1,2-DI-(Dimethylamino) Ethane	VHL	3	
—	Diesel oil	FP >61°C	HL	—
2373	Diethoxymethane	VHL	3	
2374	3,3-Diethoxypropene	VHL	3	
1154	Diethylamine	BP 55°C	VHL	3
2686	Diethylaminoethanol	VHL	3	
2684	Diethylamino Propylamine	VHL	8-3	
2432	N,N-Diethylaniline	VHL	6.1(b)	
2049	Diethylbenzene	VHL	3	
2366	Diethyl Carbonate	VHL	3	
1767	Diethyl Dichlorosilane	VHL	8-3	
2079	Diethylenetriamine	VHL	8	
1155	Diethyl Ether (Ethyl Ether)	BP 34°C	VHL	3
2685	N,N-Dimethylethylene Diamine	VHL	8-3	
1156	Diethyl Ketone	VHL	3	
1594	Diethyl Sulfate	VHL	6.1(a)	
2375	Diethyl Sulfide	VHL	3	
2751	Diethyl Thiophosphoryl Chloride	VHL	8	
1366	Diethylzinc	VHL	4.2	
1768	Difluorophosphoric Acid, Anhydrous	VHL	8	
2376	2,3-Dihydroxypropan	VHL	3	
2361	Diisobutylamine	VHL	3	
2050	Diisobutylene, Isomeric compounds	BP 101°C to 105°C	VHL	3
1157	Diisobutyl Ketone	VHL	3	
1902	Diisooctyl Acid Phosphate	VHL	8	
1158	Diisopropylamine	VHL	3	

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
1159	Diisopropyl Ether	VHL	3	
2521	Diketene, inhibited	VHL	3	
2377	1,1-Dimethoxyethane	BP 62°C VHL	3	
2252	1,2-Dimethoxyethane	VHL	3	
1032	Dimethylamine, Anhydrous	D 1.60 VHG	2.1	
1160	Dimethylamine solution	VHL	3	
2378	2-Dimethylamino Acetonitrile	VHL	3-6.1(a)	
2522	Dimethylaminoethyl Methacrylate	VHL	6.1(a)	
2253	N,N-Dimethylaniline	VHL	6.1(a)	
2379	1,3-Dimethyl Butylamine	VHL	3	
2262	Dimethyl Carbamoyl Chloride	VHL	8	
1161	Dimethyl Carbonate	VHL	3	
2263	Dimethylcyclo Hexanes	VHL	3	
2264	N,N-Dimethylcyclo Hexylamine	VHL	8	
1162	Dimethyldichloro Silane	B 70°C VHL	3-8	
2380	Dimethyldiethoxy Silane	VHL	3	
2707	Dimethyldioxanes	VHL	3	
2381	Dimethyl Disulfide	VHL	3	
2051	Dimethylethanol Amine	VHL	3	
1033	Dimethyl Ether	D 1.60 VHG	2.1	
2265	N,N-Dimethyl Formamide	VHL	3	
2382	Dimethylhydrazine, Symmetrical	VHL	3-6.1(a)	
1163	Dimethylhydrazine, Unsymmetrical	VHL	6.1(a)-3-8	
2044	2,2-Dimethylpropane other than pentane and isopentane	VHG	2.1	
2266	Dimethyl-N-Propylamine	VHL	3-8	
1595	Dimethyl Sulfate	LL	6.1(a)-8	
1164	Dimethyl Sulfide	VHL	3	
2267	Dimethyl Thiophosphoryl Chloride	VHL	8	
1370	Dimethyl Zinc	BP 46°C VHL	4.2	
1067	Dinitrogen Tetroxide (Nitrogen Dioxide), liquefied	D 1.60 VHG	2.5-5.1-8	50 t
1599	Dinitrophenol solutions	VHL	6.1(a) or (b)	
1165	Dioxane	VHL	3	
1166	Dioxolane	VHL	3	
2052	Dipentene	VHL	3	
1769	Diphenyldichloro Silane	VHL	8	
2383	Diprophylamine	VHL	3	
2384	Dipropyl Ether	VHL	3	
2710	Dipropylketone	VHL	3	
1903	Disinfectants, corrosive liquid+	VHL	8	

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
3142	Disinfectants, liquid+, poisonous	VHL	6.1	
—	Distillate	FP >61°C HL	—	
1167	Divinyl Ether, inhibited	BP 30°C VHL	3	
1771	Dodecyl Trichlorosilane	VHL	8	
2801	Dyes, liquid, corrosive+	VHL	8	
1602	Dyes, liquid, poisonous+	VHL	6.1(a) or (b)8	
1960	Engine starting fluid with flammable gas	VHG	2.1	
3082	Environmentally hazardous substances, liquid+	HL	9	
2558	Epibromohydrin	BP 135°C VHL	6.1(a)	
2023	Ephichlorohydrin	VHL	6.1(a)	
1035	Ethane, compressed	D 1.05 VHG	2.1	
1961	Ethane, refrigerated liquid	VHG	2.1	
1170	Ethanol (Ethyl Alcohol) or Ethanol solutions (Ethyl Alcohol solutions)	VHL	3	
2491	Ethanolamine or Ethanolamine solutions	VHL	8	
1173	Ethyl Acetate	VHL	3	
2452	Ethyl Acetylene, inhibited	VHG	2.1	
1917	Ethyl Acrylate, inhibited	BP 98°C VHL	3	
1036	Ethylamine	D 1.60 VHG	2.1	
2270	Ethylamine, aqueous solutions (50–70% ethylamine)	VHL	3	
2271	Ethyl Amyl Ketone	VHL	3	
2273	2-Ethylaniline	VHL	6.1(b)	
2272	N-Ethylaniline	VHL	6.1(b)	
1175	Ethylbenzene	VHL	3	
2274	N-Ethyl-N-Benzylaniline	VHL	6.1(b)	
2753	N-Ethylbenzyl Toluidines	VHL	6.1(b)	
1176	Ethyl Borate	VHL	3	
1891	Ethyl Bromide	BP 38°C VHL	6.1(b)	
1603	Ethyl Bromoacetate	VHL	6.1(a)	
2275	2-Ethylbutanol	VHL	3	
1177	Ethylbutyl Acetate	VHL	3	
1179	Ethyl Butyl Ether	VHL	3	
1178	2-Ethyl Butyraldehyde	VHL	3	
1180	Ethyl Butyrate	VHL	3	
1037	Ethyl Chloride	VHG	2.1	
1181	Ethyl Chloroacetate	VHL	6.1(a)	
1182	Ethyl Chloroformate	VHL	6.1(a)-3-8	
2935	Ethyl 2-Chloropropionate	VHL	3	
2826	Ethyl Chlorothioformate	VHL	8	

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
1862	Ethyl Crotonate	VHL	3	
2666	Ethyl Cyanoacetate	VHL	6.1(b)	
1892	Ethyl Dichloroarsine	VHL	6.1(a)	
1183	Ethyl Dichlorosilane BP 98°C	VHL	4.3-3-8	
3138	Ethylene, Acetylene ≤22% and Propylene ≤6% of mixtures, refrigerated liquid	VHG	2.1	
1135	Ethylene Chlorohydrin	VHL	6.1(a)	
1962	Ethylene, compressed D 0.98	VHG	2.1	
1604	Ethylenediamine	VHL	8-3	
1605	Ethylene Dibromide	VHL	6.1(a)	50
1184	Ethylene Dichloride	VHL	3-6.1(a)	50
1153	Ethylene Glycol Diethyl Ether	VHL	3	
2369	Ethylene Glycol Monobutyl Ether	VHL	6.1(b)	
1171	Ethylene Glycol Monoethyl Ether	VHL	3	
1172	Ethylene Glycol Monoethyl Ether Acetate	VHL	3	
1188	Ethylene Glycol Monoethyl Ether	VHL	3	
1189	Ethylene Glycol Monomethyl Ether Acetate	VHL	3	
1185	Ethyleneimine, inhibited	VHL	6.1(a)-3	50
1040	Ethylene Oxide pure or with nitrogen D 1.50	VHG	2.3-2.1	50
2983	Ethylene Oxide and Propylene Oxide Mixtures, not more than 30% ethylene oxide	VHL	3-6.1(a)	
1038	Ethylene, refrigerated liquid	VHG	2.1	
2453	Ethyl Fluoride	VHG	2.1	
1190	Ethyl Formate BP 54°C	VHL	3	
2276	2-Ethylhexylamine	VHL	8	
2748	2-Ethylhexyl Chloroformate	VHL	6.1(a)-8	
2385	Ethyl Isobutyrate	VHL	3	
2481	Ethyl Isocyanate BP 60°C	VHL	3-6.1(a)	
1192	Ethyl Lactate	VHL	3	
2363	Ethyl Mercaptan BP 35°C	VHL	3	
2277	Ethyl Methacrylate	VHL	3	
1039	Ethyl Methyl Ether D 2.10	VHG	2.1	
1193	Ethyl Methyl Ketone	VHL	3	
1194	Ethyl Nitrite solutions	VHL	3-6.1(a)	50
2524	Ethyl Orthoformate	VHL	3	
2525	Ethyl Oxalate	VHL	6.1(b)	
2435	Ethyl Phenyl Dichlorosilane BP 61°C	VHL	8	
2386	1-Ethylpiperidine	VHL	3	
1195	Ethyl Propionate	VHL	3	
2615	Ethyl Propyl Ether BP ≤61°C	VHL	3	

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
2571	Ethyl Sulfuric Acid	VHL	8	
2754	N-Ethyltoluidines	VHL	6.1(a)	
1196	Ethylthricloro Silane	VHL	3-8	
1169	Extracts, Aromatic, liquid	VHL	3	
1197	Extracts, Flavouring, liquid	VHL	3	
2582	Ferric Chloride solution	VHL	8	
1043	Fertilizer Ammoniating solution with free ammonia	HG	2.2	
1993	Flammable liquid+	VHL	3	
2924	Flammable liquid, corrosive	VHL	3	
1992	Flammable liquid, poisonous	VHL	3-6.1(a) or (b)	25
1045	Fluorine, compressed	D 1.30	VHG 2.3-5.1	25
2941	Fluoroanilines	VHL	6.1(b)	25
2387	Fluorobenzene	VHL	3	
1775	Fluoroboric Acid	VHL	3	
1776	Fluorophosphoric Acid, Anhydrous	VHL	8	
1777	Fluorosulfonic Acid	VHL	8	
2388	Fluorotoluenes	VHL	3	
1778	Fluosilicic Acid	VHL	8	
2209	Formaldehyde solutions with not less than 25% formaldehyde	VHL	8	
1780	Fumaryl Chloride	VHL	8	
2389	Furan	BP 31°C	VHL 3	
1199	Furfural	VHL	3	
2874	Furfuryl Alcohol	VHL	6.1(b)	
1201	Fusel Oil	VHL	3	
1864	Gas Drips, hydrocarbon	VHL	3	
2192	Germane	D 2.60	VHG 2.3-2.1	
2689	Glycerol-a-Monochlorohydrin	VHL	6.1(b)	
2622	Glycidaldehyde	VHL	3-6.1(b)	
1610	Halogenated irritating liquid+	VHL	6.1(a) or (b)	
1046	Helium compressed	D 0.14	NHG 2.2	
1963	Helium, refrigerated liquid	HG	2.2	
2278	n-Heptene	VHL	3	
2661	Hexachloroacetone	VHL	6.1(b)	
2279	Hexachloro Butadiene	VHL	6.1(b)	
2646	Hexachloro Cyclopentadiene	LL	6.1(a)	
2875	Hexachlorophene	VHL	6.1(b)	
1781	Hexadecyltrichloro Silane	VHL	8	
2458	Hexadiene	BP 59°C–82°C	VHL 3	
1611	Hexaethyl Tetraphosphate	VHL	6.1(a) or (b)	

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
1612	Hexaethyl Tetraphosphate and compressed gas mixtures	VHG	2.3	
2420	Hexafluoroacetone	D 5.70 LL	2.3	
2552	Hexafluoroacetone Hydrate	VHL	6.1(a)	
2193	Hexafluoroethane Refrigerant Gas R116	D 4.80 NHG	2.2	
1782	Hexafluoro phosphoric acid	VHL	8	
1858	Hexafluoro Propylene	D 5.20 NHG	2.2	
1207	Hexaldehyde	VHL	3	
1783	Hexamethylene Diamine solution	VHL	6.1(a)	
2281	Hexamethylene Diisocyanate	VHL	6.1(a)	
2493	Hexamethyleneimine	VHL	3-8	
2282	Hexanols	VHL	3	
2370	1-Hexene	BP 64°C VHL	3	
1784	Hexyl Trichlorosilane	VHL	8	
2029	Hydrazine, Anhydrous, or Aqueous >64%	LL	3-6.1(a)-8	
2030	Hydrazine Hydrate or Aqueous ≤64%	VHL	8-1.6(a)	
1787	Hydriodic Acid solution	VHL	8	
1788	Hydrobromic Acid solution	VHL	8	
1964	Hydrocarbon Gas or Mixtures—compressed+	VHG	2.1	
1965	Hydrocarbon Gas/Mixtures, liquefied+	VHG	2.1	
1789	Hydrochloric Acid solution	VHL	8	
1613	Hydrocyanic Acid, Aqueous solutions with not more than 20% hydrocyanic acid	VHL	6.1(a)	
1790	Hydrofluoric Acid solution >50%	VHL	8-1.6(a)	50
1786	Hydrofluoric Acid and Sulfuric Acid mixtures	VHL	8-1.6(a)	50
1048	Hydrogen Bromide, Anhydrous	D >1 VHG	2.3-8	
1050	Hydrogen Chloride, Anhydrous	D 1.30 VHG	2.3-8	250
2186	Hydrogen Chloride, refrigerated liquid	VHG	2.3-8	
1049	Hydrogen, compressed	D 0.07 VHG	2.1	50
1051	Hydrogen Cyanide, Anhydrous stabilized	BP 26°C VHL	6.1(a)-3	20
1052	Hydrogen fluoride, Anhydrous	BP 20°C VHL	8-6.1(a)	50
2197	Hydrogen Iodide, Anhydrous	D 4.40 VHG	2.3-8	
2034	Hydrogen and Methane mixtures, compressed	VHG	2.1	
2015	Hydrogen Peroxide stabilized, or Hydrogen Peroxide aqueous solutions, stabilized, with more than 60% Hydrogen Peroxide	VHL	5.1-8	
2014	Hydrogen Peroxide, aqueous solutions, 20%–60%	VHL	5.1-8	
2984	Hydrogen Peroxide, aqueous solutions, 8%–20%	VHL	5.1	
1966	Hydrogen, refrigerated liquid	VHG	2.1	
2202	Hydrogen, Selenide, Anhydrous	D 2.80 LG	2.3-2.1	
1053	Hydrogen Sulfide, Liquefied	D 1.20 VHG	2.3-2.1	50
1791	Hypochlorite solutions with more than 5% available chlorine	VHL	8	

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
2269	3,3-Iminodi Propylamine	VHL	8	
2814	Infectious substances, affecting humans	VHL	6.2	
1968	Insecticide gas+	HG	2.2	
1967	Insecticide gas, toxic+	VHG	2.3	
1792	Iodine Monochloride	VHL	8	
2495	Iodine Pentafluoride	BP 98°C VHL	5.1-6.1(a)-8	
2390	2-Iodobutane	VHL	3	
2391	Iodomethyl Propanes	VHL	3	
2392	Iodopropanes	VHL	3	
1994	Iron Pentacarbonyl	BP 103°C VHL	6.1(a)-3	
1969	Isobutane or Isobutane mixtures	VHG	2.1	
1212	Isobutanol (Isobutyl Alcohol)	VHL	3	
1213	Isobutyl Acetate	VHL	3	
2527	Isobutyl Acrylate	BP 61°C–63°C VHL	3	
1214	Isobutylamine	VHL	3	
1055	Isobutylene	VHG	2.1	
2393	Isobutyl Formate	VHL	3	
2528	Isobutyl Isobutyrate	VHL	3	
2486	Isobutyl Isocyanate	BP 60°C VHL	3-6.1(a)	
2283	Isobutyl Methacrylate	VHL	3	
2394	Isobutyl Propionate	VHL	3	
2045	Isobutyraldehyde	BP 64°C VHL	3	
2529	Isobutyric Acid	VHL	3	
2530	Isobutyric Anhydride	VHL	3	
2284	Isobutyronitrile	VHL	3-6.1(a)	
2395	Isobutyryl Chloride	VHL	3-8	
2478	Isocyanates, solutions+	FP <23°C VHL	3	
3080	Isocyanates, solutions+	FP <23°C–60°C VHL	6.1(a)	
2206	Isocyanates, solutions+	FP >60°C VHL	6.1(a)	
2285	Isocyanatobenzo Trifluorides	VHL	6.1(a)	
2287	Isoheptene	VHL	3	
2288	Isohexane	BP 64°C–68°C VHL	3	
2371	Isopentenes	VHL	3	
2289	Isophoronediamine	VHL	8	
2290	Isophorone Diisocyanate	VHL	6.1(a)	
1218	Isoprene, inhibited	BP 34°C VHL	3	
1219	Isopropanol (Isopropyl Alcohol)	VHL	3	
2403	Isopropenyl Acetate	VHL	3	
2303	Isopropenylbenzene	VHL	3	

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
1220	Isopropyl Acetate	VHL	8	
1793	Isopropyl Acid Phosphate	VHL	3	
1221	Isopropylamine	BP 32°C VHL	3	
1918	Isopropylbenzene	VHL	3	
2405	Isopropyl Butyrate	VHL	3	
2947	Isopropyl Chloroacetate	VHL	3-8	
2407	Isopropyl Chloroformate	VHL	3	
2934	Isopropyl 2-Chloro Propionate	VHL	3	
2406	Isopropyl Isobutyrate	VHL	3-6.1(a)	
2483	Isopropyl Isocyanate	VHL	3-6.1(a)	
1222	Isopropyl Nitrate	VHL	3	
2409	Isopropyl Propionate	VHL	3	
1224	Keystones, liquid+	VHL	3	
1056	Krypton, compressed	NHG	2.2	
1970	Krypton, refrigerated liquid	D 2.90 HG	2.2	
3163	Liquefied Gas+	NHG	2.2	
3163	Liquefied Gas, flammable+	VHG	3	
1058	Liquefied Gases, non-flammable, charged with nitrogen, carbon dioxide or air	NHG	2.2	
3157	Liquefied Gas, oxidizing+	VHG	2.2-5.1	
3162	Liquefied Gas, toxic+	VHG	2.3	
3160	Liquefied Gas, toxic, flammable+	VHG	2.3-2.1	
—	Liquefied Petroleum Gas	VHG	2.1	
2445	Lithium Alkyls	VHL	4.2	
1411	Lithium Aluminium Hydride, Ethereal	VHL	4.3-3	
2679	Lithium Hydroxide solution	VHL	8	
—	Lithium Bromide and water (Refrigerant +)	NHG	—	
3053	Magnesium alkyls	VHL	4.2	
3248	Medicines, liquid, flammable, poisonous+	VHL	3-6.1	
1228	Mercaptans, liquid or mixtures+	FP <23°C VHL	3-6.1(a)	
3071	Mercaptans, liquid or mixtures	FP ≥23°C VHL	6.1(a)	
2809	Mercury	VHL	8	
2024	Mercury compounds, liquid+	VHL	6.1(a) or (b)	
1229	Mesityl oxide	VHL	3	
2396	Methacrylaldehyde	VHL	3-6.1(a)	
1971	Methane, or Natural Gas, compressed, CNG	D 0.55 VHG	2.1	200
1972	Methane or Natural Gas, refrigerated liquid, LNG	VHG	2.1	200
1230	Methanol (Methyl Alcohol)	VHL	3-6.1(b)	
2605	Methoxymethyl Isocyanate	VHL	3-6.1(a)	

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
2293	4-Methoxy-4-Methyl Pentan-2-One	VHL	3	
3092	1-Methoxy-2-Propanol	VHL	3	
1231	Methyl Acetate	VHL	3	
1993	Methyl Acetone	VHL	3	
1060	Methyl Acetylene and Propadiene, mixtures, stabilized	D 1.40 VHG	2.1	
1919	Methyl Acrylate, inhibited	BP 80°C VHL	3	
1234	Methylal	VHL	3	
2554	Methylallyl Chloride	BP 68°C VHL	3	
1061	Methylamine, Anhydrous	D 1.09 VHG	2.1	
1235	Methylamine, Aqueous solution	VHL	3	
1233	Methylamine Acetate	VHL	3	
2294	N-Methylaniline		6.1(b)	
2938	Methyl Benzoate	VHL	6.1(b)	
2937	a-Methylbenzyl Alcohol	VHL	6.1(b)	
1062	Methyl Bromide	D 3.30 VHG	2.3	200
1647	Methyl Bromide and Ethylene Dibromide mixtures, liquid	VHL	6.1(a)	
2643	Methyl Bromoacetate	VHL	6.1(a)	
2397	3-Methylbutan-2-one	VHL	3	
2459	2-Methyl-1-Butene	BP 31°C VHL	3	
2460	2-Methyl-2-Butene	BP 39°C VHL	3	
2561	3-Methyl-1-Butene	BP 31°C VHL	3	
2945	N-Methylbutylamine	VHL	3	
2398	Methyl tert-Butyl Ether	VHL	3	
1237	Methyl Butyrate	VHL	3	
1063	Methyl Chloride = R40	D 1.80 VHG	2.1	
1912	Methyl Chloride and Methylene Chloride mixture	VHG	2.2	
2295	Methyl Chloroacetate	VHL	6.1(a)	
1238	Methyl Chloroformate	VHL	6.1(a)-3-8	
1239	Methyl Chloromethyl Ether	BP 60°C LL	6.1(a)-3	
2933	Methyl-2-Chloro Propionate	VHL	3	
2534	Methylchlorosilane	D >1 VHG	2.3-2.1-8	
1648	Methyl Cyanide	BP 82°C VHL	3-6.1(b)	
2617	Methyl Cyclohexanols	FP ≤61°C VHL	3	
2297	Methylcyclo Hexanone	VHL	3	
2299	Methyldichloro Acetate	VHL	6.1(b)	
1242	Methyldichloro Silane	BP 41°C VHL	4.3-3-8	
2300	2-Methyl-5-Ethyl Pyridine	VHL	6.1(b)	
2454	Methyl Fluoride	VHG	2.1	
1243	Methyl Formate	BP 31°C VHL	3	

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
2301	2-Methylfuran	BP 63°C	VHL	3
2302	5-Methylhexan-2-one		VHL	3
1244	Methylhydrazine		VHL	6.1(a)-3-8
2644	Methyl Iodide		VHL	6.1(a)
2053	Methyl Isobutyl Carbinol		VHL	3
1245	Methyl Isobutyl Ketone		VHL	3
2480	Methyl Isocyanate	BP 38°C	VHL	6.1(a)-3
1246	Methyl Isopropenyl Ketone, inhibited		VHL	3
2477	Methyl Isothiocyanate		VHL	3-6.1(a)
2400	Methyl Isovalerate		VHL	3
1064	Methyl Mercaptan	D 1.70	VHG	2.3-2.1
1247	Methyl Methacrylate Monomer inhibited	BP 101°C	VHL	3
2535	Methylmorpholine		VHL	3
2455	Methyl Nitrate		VHL	2.2
2606	Methyl Orthosilicate		VHL	3-6.1(a)
2461	Methyl Pentadiene		VHL	3
2560	2-Methylpentan-2-OL		VHL	3
2437	Methylphenyl Dichlorosilane		VHL	8
2399	1-Methylpiperidine		VHL	3
1248	Methyl Propionate		VHL	3
2612	Methyl Propyl Ether	BP 39°C	VHL	3
1249	Methyl Propyl Ketone		VHL	3
2536	Methyltetrahydro Furan		VHL	3
2533	Methyltrichloro Acetate		VHL	6.1(b)
1250	Methyltrichloro Silane	BP 66°C	VHL	3-8
2367	a-Methylvaler Aldehyde		VHL	3
1251	Methyl Vinyl Ketone		VHL	3
1796	Mixed Acid		VHL	8
2054	Morpholine	BP 129°C	VHL	3
1649	Motor Fuel Anti-knock mixtures		VHL	6.1(a)
2553	Naphtha		VHL	3
1256	Naphtha, solvent		VHL	3
2304	Naphthalene, molten		VHL	4.1
	Natural Gas, see Methane			
1065	Neon, compressed		NHG	2.2
1913	Neon, refrigerated liquid		HG	2.2
1259	Nickel Carbonyl		LL	6.1(a)-3
1654	Nicotine		VHL	6.1(a)
1796	Nitrating Acid mixtures		VHL	8

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
1826	Nitrating Acid mixtures, spent	VHL	8	
2031	Nitric Acid, other than red fuming	VHL	8	
2032	Nitric Acid, red fuming	VHL	8-5.1-6.1(a)	
1660	Nitric Oxide	D 1.40 VHG	2.3	50 t
1975	Nitric Oxide with Dinitrogen Tetroxide	VHG	2.3	50 t
2730	Nitroanisole	VHL	6.1(b)	
1662	Nitrobenzene	VHL	6.1(a)	
2306	Nitrobenzo Trifluorides	VHL	6.1(a)	
2059	Nitrocellulose solutions, flammable with more than 12.6% nitrogen, by mass, and not more than 55% nitrocellulose	VHL	3	
2307	3-Nitro-4-Chlorobenzo Trifluoride	VHL	6.1(a)	
1066	Nitrogen, compressed	D 0.97 NHG	2.2	
1977	Nitrogen, refrigerated liquid	HG	2.2	
2451	Nitrogen Trifluoride	D 2.40 VHG	2.3-5.1	
2421	Nitrogen Trioxide	D 2.60 VHG	2.3-5.1	50 t
3064	Nitroglycerin (1–5%) solution in alcohol	VHL	3	
1798	Nitrohydrochloric Acid	VHL	8	
1261	Nitromethane	VHL	3	
2608	Nitropropanes	VHL	3	
1069	Nitrosyl Chloride	D 2.30 VHG	2.3-8	
1070	Nitrous Oxide, compressed	D 1.50 VHG	2.2-5.1	50
2201	Nitrous Oxide, refrigerated liquid	VHG	2.2-5.1	50
1799	Nonyl trichlorosilane	VHL	8	
2251	2,5-Norbornadiene (Dicycloheptadiene)	VHL	3	
1800	Octadecyl Trichlorosilane	VHL	8	
2309	Octadiene	VHL	3	
2422	Octafluorobut-2-ENE	D 7.00 NHG	2.2	
1976	Octafluorocyclo Butane	D 7.00 NHG	2.2	
2424	Octafluoropropane	NHG	2.2	
1191	Octyl Aldehydes, flammable	VHL	3	
3023	tert-Octyl Mercaptan	VHL	6.1(a)-3	
1801	Octyl Trichlorosilane	VHL	8	
1071	Oil gas	VHG	2.1	
—	Oils, Combustible, e.g. bunker, furnace, heat-transfer, lubricating, transformer and vegetable	<BP HL ≥BP VHG	— —	
3101	Organic Peroxide Type B, Liquid+ also 3111, 3103, 3113, 3105, 3107, 3109, 3119	VHL	5.2	
2471	Osmium Tetroxide	LL	6.1(a)	
1072	Oxygen, compressed	D 1.10 VHG	2.2-5.1	2000
1073	Oxygen, refrigerated liquid	VHG	2.2-5.1	2000

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)	
2190	Oxygen difluoride	D 1.90	LG	2.3-5.1	
—	Ozone gas		VHG	—	
3066	Paint (including lacquer, stain, liquid filler, etc.)—Corrosive		HL	8	
1263	Paint (including lacquer, stain, liquid filler, etc.)—Flammable		HL	3	
1264	Paraldehyde		VHL	3	
1380	Pentaborane	BP 48°C–63°C	VHL	4.2-6.1(a)	
1669	Pentachloroethane		VHL	6.1(a)	
2286	Pentamethylheptane		VHL	3	
2310	Pentan-2,4-Dione		VHL	3	
1265	n-Pentane (or Isopentane)		VHL	3	
2750	1-Pentol		VHL	8	
1873	Perchloric Acid, 50–72% acid by mass		VHL	5.1-8	
1670	Perchloromethyl Mercaptan		VHL	6.1(a)	
3083	Perchloryl Fluoride	D 3.50	VHG	2.3	
1266	Perfumery Products, with flammable solvent		VHL	3	
—	Pesticides, almost all are		VHL	3 and/or 6.1	200
1075	Petroleum Gases, liquefied		VHG	2.1	200
—	Petroleum products, includes:	FP ≤61°C	VHL	3	
1145	Cyclohexane				
1146	Cyclopentane				
2457	2,3-Dimethylbutane				
1863	Fuel, aviation, turbine engine				
1202	Gas Oil				
1206	Heptanes				
1208	Hexanes				
1216	Isooctene				
1223	Kerosene				
2296	Methylcyclohexane				
2298	Methylcyclopentane				
1203	Motor spirit, includes gasoline or petrol				
1255	Naphtha, petroleum				
1257	Natural gasoline				
1920	Nonanes				
1262	Octanes				
1267	Petroleum crude oil				
1268	Petroleum distillates+				
1270	Petroleum fuel				
1271	Petroleum spirit				
1288	Shale Oil				

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
1294	Toluene			
1300	Turpentine substitute (Mineral Turpentine)			
2311	Phenetidines	VHL	6.1(b)	
2312	Phenol, molten	VHL	6.1(a)	
2821	Phenol, solutions	VHL	6.1	
1803	Phenolsulfonic Acid, liquid	VHL	8	
2470	Phenyl Acetonitrile, liquid	VHL	6.1(b)	
2577	Phenylacetyl Chloride	VHL	8	
1672	Phenylcarbyamine Chloride	VHL	6.1(a)	
2746	Phenyl Chloroformate	VHL	6.1(a)	
2487	Phenyl Isocyanate	VHL	6.1(a)	
2337	Phenyl Mercaptan	VHL	6.1(a)	
2798	Phenyl Phosphorus Dichloride	VHL	8	
2799	Phenyl Phosphorus Thiodichloride	VHL	8	
1804	Phenyltrichloro Silane	VHL	8	0.75
1076	Phosgene (i.e. Carbonyl Chloride)	D 3.50 LL	2.3	0.75
2199	Phosphine	D 1.20 VHL	2.3	0.75
1805	Phosphoric Acid	VHL	8	0.75
1810	Phosphorus Oxychloride	VHL	8	
2198	Phosphorus Pentafluoride	D 4.30 VH G	2.3	
1808	Phosphorus Tribromide	VHL	8	
1809	Phosphorus Trichloride	VHL	8	
2447	Phosphorus, White, molten	VHL	4.2-6.1(a)	
2313	Picolines	VHL	3	
2368	a-Pinene	VHL	3	
1272	Pine Oil	VHL	3	
2401	Peperidine	VHL	3	
2315	Polychlorinated Biphenols	VHL	9	
2427	Potassium Chlorate Aqueous solution	VHL	5.1	
1814	Potassium Hydroxide solution	VHL	8	
2200	Propadiene, inhibited	VH G	2.1	
1978	Propane	VH G	2.1	
1274	n-Propanol	VHL	3	
1275	Propionaldehyde	VHL	3	
1848	Propionic Acid	VHL	8	
2496	Propionic Anhydride	VHL	8	
2404	Propionitrile	VHL	3-6.1(a)	
1815	Propionyl Chloride	BP 80°C VHL	3-8	
1276	n-Propyl acetate	VHL	3	

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
1277	Propylamine	BP 49°C	VHL	3
2364	n-Propylbenzene		VHL	3
1278	Propyl Chloride	BP 47°C	VHL	3
2740	n-Propyl Chloroformate		VHL	6.1(a)-3-8
1077	Propylene		VHG	2.1
2611	Propylene Chlorohydrin		VHL	6.1(a)
2258	1,2-Propylenediamine		VHL	8
1279	Propylene Dichloride		VHL	3
1921	Propyleneimine, inhibited		VHL	3
1280	Propylene Oxide	BP 35°C	VHL	3
2850	Propylene Tetramer		VHL	3
1281	Propyl Formates	BP 68°C	VHL	3
2482	n-Propyl Isocyanate		VHL	3
1865	n-Propyl Nitrate		VHL	3
1816	Propyl Trichlorosilane		VHL	8
1282	Pyridine		VHL	3
3194	Pyrophoric Liquid, inorganic+		VHL	4.2
2845	Pyrophoric Liquid, organic+		VHL	4.2
1817	Pyrosulfuryl Chloride		VHL	8
1922	Pyrrolidine		VHL	3
2656	Quinoline		VHL	6.1(a)
1979	Rare Gas Mixtures (He, Ne, Xe, Ar, Kr)		NHG	2.2
—	Refrigerant Gases, non-toxic and non-flammable (refer to AS/NZS 1677.1)		NHG	2.2
—	Refrigerant Gases, toxic or flammable (refer to AS/NZS 1677.1)		VHG	2.3, 2.1
1286	Rosin oil		VHL	3
1287	Rubber solution		VHL	3
2677	Rubidium Hydroxide		VHL	8
—	Sarin		LG	
2203	Silane		VHG	2.1
1818	Silicon Tetrachloride	D 1.10	VHL	8
1859	Silicon Tetrafluoride	D 3.60	VHG	2.3
1819	Sodium Aluminate solution		VHL	
1686	Sodium Arsenite solutions		VHL	6.1(a)
2428	Sodium Chlorate, Aqueous solution		VHL	5.1
1908	Sodium Chlorite solution		VHL	8
2317	Sodium Cuprocyanide solution		VHL	6.1(a)
1824	Sodium Hydroxide solution		VHL	8
1827	Stannic Chloride, Anhydrous		VHL	8

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
—	Steam	HG	—	
2676	Stibine	D 4.30 VHG	2.3-2.1	
2055	Styrene Monomer, inhibited	VHL	3	
1828	Sulfur Chlorides	VHL	8	
1079	Sulfur Dioxide, Liquefied	D 2.30 VHG	2.3	200
1080	Sulfur Hexafluoride	D 5.10 NHG	2.2	
1830	Sulfuric Acid	VHL	8	
2448	Sulfur, molten	VHL	4.1	
1833	Sulfurous Acid	VHL	8	
2418	Sulfur Tetrafluoride	D 3.70 VHG	2.3	
1834	Sulfuryl Chloride	BP 69°C VHL	8	
2191	Sulfuryl Fluoride	D 3.50 VHG	2.3	
1999	Tars, Liquid including bitumen	VHL	3	
1693	Tear Gas Substances, liquid/solid+	VHL	6.1(a)	
2195	Tellurium Hexafluoride	D 7.20 VHG	2.3	
2319	Terpine Hydrocarbons+	VHL	3	
2541	Terpinolene	VHL	3	
2504	Tetrabromoethane	VHL	6.1(b)	
1702	Tetrachloroethane	VHL	6.1(a)	
1897	Tetrachloroethylene	VHL	6.1(b)	
1704	Tetraethyl Dithiopyrophosphate	VHL	6.1(a) or (b)	
2320	Tetraethylene Pentamine	VHL	8	
1705	Tetraethyl Pyrophosphate and compressed gas	LG	2.3	
1292	Tetraethyl Silicate	VHL	3	
1081	Tetrafluoroethylene, inhibited	D 3.50 VHG	2.1	
2498	1, 2, 3, 6-Tetrahydrobenzaldehyde	VHL	3	
2056	Tetrahydrofuran	BP 66°C VHL	3	
2943	Tetrahydrofurfurylamine	VHL	3	
2410	1, 2, 3, 6-Tetrahydropyridine	VHL	3	
2412	Tetrahydrothiophene	VHL	3	
2749	Tetramethylsilane	BP 27°C VHL	3	
1510	Tetranitromethane	VHL	5.1-6.1(b)	
2413	Tetrapropylorthotitanate	VHL	3	
2785	Thia-4-Pentanal	VHL	6.1(b)	
2436	Thioacetic Acid	VHL	3	
2966	Thioglycol	VHL	6.1(a)	
1940	Thioglycolic Acid	VHL	8	
2936	Thiolactic Acid	VHL	6.1(a)	
1836	Thionyl Chloride	BP 79°C VHL	8	

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
2414	Thiophene	VHL	3	
2474	Thiophosgene	VHL	6.1(a)	
1837	Thiophosphoryl Chloride	VHL	8	
1838	Titanium Tetrachloride	VHL	8	500
1294	Toluene	VHL	3	
2078	Toluene Diisocyanate	VHL	6.1(a)	200
2610	Triallylamine	VHL	3	
2609	Triallyl Borate	VHL	6.1(b)	
2542	Tributylamine	VHL	8	
2564	Trichloroacetic Acid, solution	VHL	8	
2442	Trichloroacetyl Chloride	VHL	8	
2321	Trichlorobenzenes	VHL	6.1(b)	
2322	Trichlorobutene	VHL	6.1(a)	
2831	1, 1, 1-Trichloroethane	VHL	6.1(b)	
1710	Trichloroethylene	BP 87°C	VHL	6.1(b)
1295	Trichlorosilane	BP 32°C	VHL	4.3
2574	Tricresyl Phosphate, with >3% or the isomer		VHL	6.1(a)
1296	Triethylamine		VHL	3
2259	Triethylene Tetramine		VHL	8
2323	Triethyl Phosphite		VHL	3
2699	Trifluoroacetic Acid		VHL	8
3057	Trifluoroacetyl Chloride		VHG	2.3
1082	Trifluorochloroethylene, inhibited	D 4.00	VHG	2.1
2324	Triisobutylene		VHG	3
2616	Triisopropyl Borate		VHL	3
2438	Trimethyl Acetyl Chloride	BP 108°C	VHL	8
1083	Trimethylamine, Anhydrous	D 2.10	VHG	2.1
2325	1, 3, 5-Trimethylbenzene		VHL	3
2416	Trimethyl Borate	BP 67/8°C	VHL	3
1298	Trimethyl Chlorosilane	BP 58°C	VHL	3
2326	Trimethylcyclohexylamine		VHL	8
2327	Trimethylhexamethylenediamines		VHL	8
2328	Trimethylhexamethylene Diisocyanate		VHL	6.1(b)
2329	Trimethyl Phosphite		VHL	3
2260	Tripropylamine		VHL	3
2196	Tungsten Hexafluoride	D 10.3 BP 19.5°C	VHG	2.3
1299	Turpentine		VHL	3
2330	Undecane		VHL	3
2058	Valeraldehyde	BP 103°C	VHL	3

(See end of Table for Legend)

(continued)

TABLE 3.1 (continued)

UN No.	Fluid name	Fluid type to Table 3.2	ADG Code Class and subrisk	MHF threshold quantity (Tonnes)
2502	Valeryl Chloride	VHL	8	
2443	Vanadium Oxytrichloride	VHL	8	
2444	Vanadium Tetrachloride	VHL	8	
1301	Vinyl Acetate, inhibited	VHL	3	
1085	Vinyl Bromide, inhibited	D 3.7 BP 16°C	VHL	2.1
2838	Vinyl Butyrate, inhibited	VHL	3	
1086	Vinyl Chloride, inhibited	D 2.20	VHG	2.1
2589	Vinyl Chloroacetate	VHL	6.1(a)	
1302	Vinyl Ethyl Ether, inhibited	BP 36°C	VHL	3
1860	Vinyl Fluoride, inhibited	D 1.60	VHG	2.1
1303	Vinylidene Chloride, inhibited	BP 32°C	VHL	3
1304	Vinyl Isobutyl Ether, inhibited	VHL	3	
1087	Vinyl Methyl Ether, inhibited	D 2.0 BP 6°C	VHG	2.1
2618	Vinyltoluene, inhibited	VHL	3	
1305	Vinyltrichlorosilane	BP 92°C	VHL	3
—	Water, fresh and sea:	>100°C	HG	—
		>90°C ≤100°C	HL	—
		≤90°C	NHL	—
—	Water based potable liquids, e.g. milk, soups, soft drinks	>100°C	HG	—
		>90°C ≤100°C	HL	—
		≤90°C	NHL	—
1306	Wood preservatives, liquid	VHL	3	
2063	Xenon	D 4.50	NHG	2.2
1307	Xylenes	VHL	3	
1711	Xylidines	VHL	6.1(a)	
1701	Xylyl Bromide	VHL	6.1(a)	
1840	Zinc Chloride solution	VHL	8	

LEGEND:

+ = Not otherwise specified

BP = Boiling point at standard or atmospheric pressure

D = Vapour density at standard pressure relative to air at same temperature (values are listed only for gases heavier than air except for some common gases)

FP = Flashpoint

HG = Harmful gas

HL = Harmful liquid

LG = Lethal gas

LL = Lethal liquid

MP = Melting point

NHG = Non-harmful gas

NHL = Non-harmful liquid

VHG = Very harmful gas

VHL = Very harmful liquid

NOTES:

1 Where a fluid is not listed, or where users have doubt, they should determine fluid types from references such as Material Safety Data Sheets (MSDS), tests, calculations, experience or supplier data.

2 See Clause 3.2.6 for effect of temperature; see Clause 3.2.7 for effect of mixtures and concentration.

TABLE 3.2
TYPES AND CLASSES OF FLUIDS

Main property of fluid	Form of fluid (Note 1)	Fluid type to Clause 2.2.2	ADG Code Class
LETHAL [i.e. very toxic (Note 2) or highly radioactive]	Gas	LG	2.3
	Liquid	LL	6.1(a) or 7
EXPLOSIVE	Liquid	VHL	1.1-1.6
FLAMMABLE			
— Extremely flammable	Gas	VHG	2.1
— Flammable [i.e. flashpoint $\leq 61^{\circ}\text{C}$ or the operating temperature (Note 3)]	Liquid	VHL	3
— Flammable solid or self-reactive substances	Liquid	VHL	4.1
— Spontaneously combustible	Liquid	VHL	4.2
— Emits flammable gas when wet	Liquid	VHL	4.3
TOXIC (i.e. poisonous) (Note 4)			
— Toxic and very toxic (not in lethal)	Gas	VHG	2.3
— Very toxic (not in lethal)	Liquid	VHL	6.1 (PG I & II)
— Toxic	Liquid	VHL	6.1 (PG III)
— Infectious substances (bacteria, viruses, etc.)	Liquid	VHL	6.2
HARMFUL (Note 4)	Gas or liquid	VHG or VHL	—
OXIDIZING			
— Oxidizing gas	Gas	VHG	2.2 (Subrisk 5.1)
— Oxidizing agent	Liquid	VHL	
— Organic peroxides	Liquid	VHL	
RADIOACTIVE excluding highly radioactive	Gas or liquid	VHG or VHL	7
CORROSIVE			
— Very corrosive to living tissue and metal	Liquid	VHL	8 (PG I) 8 (PG II & III)
— Corrosive to living tissue and metal	Liquid	VHL	
COMBUSTIBLE	Liquid	HL	—
ENVIRONMENTALLY HAZARDOUS	Liquid	HL	9
EXTREMELY HOT OR COLD (i.e. design temperature less than -30°C or over 90°C except air as specified in Clause 3.2.6)	Liquid Gas	HL HG	— —
IRRITANT TO HUMANS (Note 5)	Gas	HG	2.2 (selected) 9
ENVIRONMENTALLY HAZARDOUS	Gas	HG	
NOT IRRITANT TO HUMANS NOT ENVIRONMENTALLY HAZARDOUS	Gas	NHG	2.2 (Notes 6 and 7)
NON-HARMFUL (Note 7)	Liquid	NHL	—

LEGEND:

HG = Harmful gas
HL = Harmful liquid
LG = Lethal gas
LL = Lethal liquid

NHG = Non-harmful gas
NHL = Non-harmful liquid
VHG = Very harmful gas
VHL = Very harmful liquid

NOTES TO TABLE 3.2:

- 1 Solid substances are assumed to be 'liquids' when fluidized as slurries or to be 'gas' when fluidized as powder, fume, dust, and the like, in air or other gases.
- 2 Lethal material is 'very toxic' in Model Work Health and Safety Regulations, Safe Work Australia and has a time weighted average exposure standard (Acute Lethal Effect—NOHSC:1003) ≤ 0.1 ppm. Here ppm = part per million by volume, or equivalent concentration in $\text{mg}/\text{m}^3 = \text{ppm} \times \frac{\text{molecular weight}}{24.4}$ and, if applicable, ADG Code Packaging Group 1 or equivalent.
- 3 If the operating temperature exceeds 61°C.
- 4 Includes some carcinogens, mutagens and teratogens and inhalation sensitizers. See Clause 2.2.3.
- 5 This includes Class 2 or 6.1 substances at concentrations which are not hazardous to humans and also skin sensitizing substances.
- 6 Air, nitrogen, carbon dioxide, refrigerant gases are typical examples.
- 7 If installed in areas without adequate ventilation, consideration shall be given to the fluid classification type if a hazard with oxygen depletion is possible.
- 8 Harmful to human tissue.

APPENDIX A
LIST OF REFERENCED DOCUMENTS
(Normative)

AS	
1210	Pressure vessels
1228	Pressure equipment—Boilers
2030	Gas cylinders (series)
3920	Assurance of product quality
3920.1	Part 1: Pressure equipment manufacture
4041	Pressure piping
4458	Pressure equipment—Manufacture
4942	Pressure equipment—Glossary of terms
AS/NZS	
1200	Pressure equipment
1677	Refrigerating systems
1677.1	Part 1: Refrigerant classification
3788	Pressure equipment—In-service inspection
ADG Code	Australian Dangerous Goods Code
NOHSC	
1003	Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment
1008	Approved Criteria for Classifying Hazardous Substances
1010	National Standard for Plant
1014	National Standard for the Control of Major Hazard Facilities
2007	National Code of Practice for the Control of Workplace Hazardous Substances
2016	National Code of Practice for the Control of Major Hazard Facilities
AMBSC	Australian Miniature Boiler Safety Committee
AMBSC Code	Part 1: Copper boilers
AMBSC Code	Part 2: Steel boilers, Briggs type
AMBSC Code	Part 3: Sub-miniature boilers
AMBSC Code	Part 4: Duplex steel boilers
Safe Work Australia	
Model Work Health and Safety Regulations	
Hazardous Substances Information System	

APPENDIX B
 TABULAR METHOD FOR HAZARD LEVELS CALCULATION
 (Normative)

B1 GENERAL

This method is a conservative alternate method to the numerical method using Equation 2.1 to determine the hazard level of pressure equipment. (See Clause 2.2 for numerical method.)

This method is deemed to include an increase in hazard level consistent with Clause 1.3 in circumstances where equipment is close to the boundary between two hazard levels.

B2 METHOD OF CALCULATION

The hazard levels A, B, C, D and E of various types of pressure equipment types shall be determined from Table B1 and the associated clauses using the following procedure or equivalent:

Table B1 shall be used in conjunction with Clauses 2.2.2 to 2.2.13 as follows:

- (a) Identify the type of pressure equipment (boiler, vessel, piping, etc.) according to the 'Equipment' column of Table B1.

Identify the values of the following:

- (i) P the design pressure in megapascals. If P is below the minimum value in Table B1, the hazard level is E except for Clauses 2.2.5(a)(v), 2.2.10 and 2.2.11.
- (ii) V (for all equipment except piping) the volume, in litres (see Clause 2.2.4). If V is below the minimum value in Table B1, the hazard level is E.
- (iii) D (for piping only) the nominal pipe diameter, in millimetres. If D is below the minimum value in Table B1, the hazard level is E, except for Clause 2.2.12.
- (b) Determine the initial value of the product PV or PD as follows:
- (i) PV in megapascal litres, for all equipment except piping.
- (ii) PD in megapascal millimetres, for piping.
- (c) Determine the final value of PV or PD by multiplying the initial PV or PD value by the appropriate factor(s) in Clause 2.2.5, where required.
- (d) Identify the contents of the equipment, and whether they will be gas or liquid (see Clauses 2.2.2, 2.2.3 and 3.2).
- (e) Determine the fluid type of the contents using Section 3 and Table 3.1.
- (f) Determine the hazard level (A, B, C, D or E) using the combination of identified equipment type, fluid type and final value of PV (or PD for piping), in the appropriate area of Table B1.
- (g) Revise the hazard level to comply with Clauses 2.2.6 to 2.2.9 and 2.2.11 to 2.2.13.

TABLE B1
HAZARD LEVELS OF PRESSURE EQUIPMENT

Equipment—Type and conditions (see Clause 2.2.7)				Hazard level (see Clauses 2.2.6, 2.2.8 and 2.2.9)											
1 PRESSURE VESSELS (except vacuum vessels and boilers)—includes unfired, fired, static and transportable vessels															
Fluid type of contents (see Clauses 2.2.2 and 2.2.3)		Volume (V) L	Pressure (P) MPa (see Clauses 2.2.5 (a)(v) and 2.2.10)	Value of PV, (as modified by Clauses 2.2.5 and 2.2.10) MPa.L (see Clause 2.2.4)											
				0.1 0.3	1 3	10 30	10 ² 3 × 10 ²	10 ³ 3 × 10 ³	10 ⁴ 3 × 10 ⁴	10 ⁵ 3 × 10 ⁵	10 ⁶ 3 × 10 ⁶	10 ⁷ 3 × 10 ⁷	10 ⁸		
1.1	Lethal (see Clause 2.2.11)	Gas (LG)	>0.05	>0.05	C				B			A			
		Liquid (LL)	>0.2		E	D	C		B			A			
1.2	Very harmful	Gas (VHG)	>0.2		E	D	C		B			A			
		Liquid (VHL)	>1.0		E		D	C	B					A	
1.3	Harmful	Gas (HG)	>0.2		E		D	C	B					A	
		Liquid (HL)	>1.0		E	E		D	C		B				A
1.4	Non-harmful (see Clause 2.2.6)	Gas (NHG)	>0.2		E		D	C	D	C		B			A
		Liquid (NHL)	>10		E				D	C		B			
2 VACUUM VESSELS (including vacuum furnaces)															
2.1	Vacuum jackets		<-0.05 gauge i.e. <0.05 abs. or >0.05 vacuum							E					
2.2	All other types of vacuum vessels				Same as for pressure vessels in 1 above but use a value of 0.1 PV										

(continued)

TABLE B1 (continued)

Equipment—Type and conditions (see Clause 2.2.7)				Hazard level (see Clauses 2.2.6, 2.2.8 and 2.2.9)											
3 BOILERS															
	Type	Volume (V) L	Pressure (P) MPa	Value of PV, (as modified by Clauses 2.2.5 and 2.2.10) MPa.L (see Clause 2.2.4)											
				0.1 0.3	1 3	10 35	10 ² 3 × 10 ²	10 ³ 3 × 10 ³	10 ⁴ 3 × 10 ⁴	10 ⁵ 3 × 10 ⁵	10 ⁶ 3 × 10 ⁶	10 ⁷ 3 × 10 ⁷	10 ⁸		
3.1	All types except below	>2	>0.05 ≤3.2		E	D	C				B		A		
		>0	>3.2								B		A		
3.2	Miniature boilers complying with AMBSC Code	≤50	≤0.7		D									Not applicable	
4 HOT WATER HEATERS, FIRED HEATERS AND STERILIZERS Same as pressure vessels, including Clause 2.2.5(a)(i), except a hot water heater with a large open vent is hazard level E															
5 PRESSURE PIPING (except vacuum) (see Clauses 2.2.12 and 2.2.13)															
	Fluid type of contents (see Clauses 2.2.2 and 2.2.3)		Nom. size (D) mm	Pressure (P) MPa	Value of PD, (as modified by Clauses 2.2.5 and 2.2.12) MPa.mm										
					10 15	25 50	75 100	150 250	350 500	750 1000	1500 2500	3500 10 000			
5.1	Lethal	Gas	>25	>0.05	D	C				B			A		
		Liquid	>25		E	D	C			B			A		
5.2	Very harmful	Gas	>25			E	D	C			B			A	
		Liquid	>32			E		D	C		B			A	
5.3	Harmful	Gas	>32			E		D		C		B		A	
		Liquid	>100			E			D		C		B	A	
5.4	Non-harmful (see Clause 2.2.6)	Gas	>32			E			D	C				B	
		Liquid	>200			E					D	C		B	

(continued)

TABLE B1 (continued)

Equipment—Type and conditions (see Clause 2.2.7)	Hazard level (see Clauses 2.2.6, 2.2.8 and 2.2.9)
6	PRESSURE SAFETY DEVICES Pressure safety devices shall be considered the same hazard level as the equipment to which they are attached

LEGEND:

D = nominal size (diameter) of piping, in millimetres (mm)

P = design pressure of equipment (gauge unless noted), in megapascals (MPa)

V = volume of contained pressurized fluid in the single item of equipment, in litres (L) up to port of connection (see AS 1210)

PV = product of *P* and *V*, in megapascal litres (MPa.L)

PD = product of *P* and *D*, in megapascal millimetres (MPa.mm)

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