A guidebook intended for use by first responders during the initial phase of a transportation incident involving dangerous goods/hazardous materials.
DO NOT USE THIS FLOWCHART if more than one hazardous material/dangerous good is involved. Immediately call the appropriate emergency response agency.

**WARNING**

**RESIST RUSHING IN!**

APPROACH INCIDENTS FROM UPWIND, UPHILL OR UPSTREAM

STAY CLEAR OF SPILLS, VAPOURS, FUMES, SMOKE AND POTENTIAL HAZARDS

**BEFORE AN EMERGENCY – BECOME FAMILIAR WITH THIS GUIDEBOOK**

First responders must be trained in the use of this guidebook.
EMERGENCY PROCEDURE GUIDE EXTRACTS

Prime contractors may use extracts of the individual guides from this guide book as emergency procedure guides. If individual extracts are used, ensure the following information is extracted and carried in the vehicle:

- The relevant guides for all dangerous goods being transported
- All relevant information referred to in those guides (e.g. information from Table 1)
- The vehicle fire guide (Guide 00)

Note: the information must be in the form, or substantially in the form as presented in the guide book.

TRANSPORT DOCUMENTATION

Transport Documents can be found as follows:

- Road – kept in the cab of a motor vehicle
- Rail – kept in possession of the train driver
- Aviation – kept in possession of the aircraft pilot
- Marine – kept with the Master of the vessel

Transport Documents provide vital information regarding the hazardous materials/dangerous goods to initiate protective actions.

Information provided:

- 4-digit identification number, UN number (go to yellow pages)
- Proper shipping name (go to blue pages)
- Hazard class or division number of material, including sub-hazard
- Packing group
- Emergency response telephone number
- Information describing the hazards of the material (entered on or attached to transport document)

### Example of Emergency Contact Details

Liquid Chemical Company
123 Through Street
UPTOWN
02 9876 5432

Delivery to:
Sparkling Pools
1 Main Road
DOWNTOWN

### Dangerous Goods Details

<table>
<thead>
<tr>
<th>UN Number</th>
<th>Proper Shipping Name</th>
<th>Packing Group</th>
<th>Hazard Class or Division No.</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN 1230</td>
<td>METHANOL</td>
<td></td>
<td>Class 3, 6.1, PG 1</td>
<td>480L</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12 x 40L Jerricans</td>
</tr>
<tr>
<td>UN 1824</td>
<td>SODIUM HYDROXIDE SOLUTION</td>
<td></td>
<td>Class 8, PG II</td>
<td>1200L</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6 x 200L Drums</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UN NUMBER</th>
<th>PROPER SHIPPING NAME</th>
<th>PACKING GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN 1230</td>
<td>METHANOL</td>
<td></td>
</tr>
<tr>
<td>UN 1824</td>
<td>SODIUM HYDROXIDE SOLUTION</td>
<td></td>
</tr>
</tbody>
</table>

IN AN EMERGENCY, IN AUSTRALIA CALL 000 | IN NEW ZEALAND CALL 111
IF TRANSPORT DOCUMENTS ARE NOT AVAILABLE
The UN number may be available from other sources for example:

PLACARD AND PANEL WITH UN NUMBER
The 4-digit UN Number may be shown on the diamond-shaped placard or on an adjacent orange panel displayed on the ends and sides of a cargo tank, vehicle or rail car.

* For the purposes of this guidebook, the terms hazardous materials/dangerous goods are synonymous.

EMERGENCY INFORMATION PANEL (EIP)
If the goods are in bulk containers or placardable units, the UN number and proper shipping name should appear on the emergency information panel attached to the vehicle or container.

PACKAGE MARKINGS AND LABELS
All packages containing dangerous goods should be marked and labelled with a class label, UN number and proper shipping name.

IF THE UN NUMBER OR PROPER SHIPPING NAME IS NOT AVAILABLE
Placarding on the vehicle should be matched with the labels on pages 4 and 5. The appropriate guide should then be used.
INTRODUCTION TO THE TABLE OF MARKINGS, LABELS AND PLACARDS

USE THIS TABLE ONLY WHEN THE UN NUMBER OR PROPER SHIPPING NAME IS NOT AVAILABLE.

The next two pages display the placards used on transport vehicles carrying dangerous goods with the applicable reference GUIDE circled. Follow these steps:

1. Approach scene from upwind, uphill or upstream at a safe distance to safely identify and/or read the placard or orange panel. Use binoculars if available.

2. Match the vehicle placard(s) with one of the placards displayed on the next two pages.

3. Consult the circled guide number associated with the placard. Use that guide information for now. For example:
   - Use GUIDE 127 for a FLAMMABLE (Class 3) placard.
   - Use GUIDE 153 for a CORROSIVE (Class 8) placard.
   - Use GUIDE 111 when the MIXED / DANGEROUS placard is displayed or the nature of the spilled, leaking or burning material is not known. Also use this GUIDE when the presence of dangerous goods is suspected but no placards can be seen.

If multiple placards point to more than one guide, initially use the most conservative guide (i.e., the guide requiring the greatest degree of protective actions).

4. Guides associated with the placards provide the most significant risk and/or hazard information.

5. When specific information, such as UN number or proper shipping name, becomes available, the more specific Guide recommended for that material must be consulted.

6. A single asterisk (*) on orange placards represent an explosive's compatibility group letter. The asterisk must be replaced with the appropriate compatibility group letter. Refer to the Glossary.

7. Double asterisks (**) on orange placards represent the division of the explosive. The double asterisks must be replaced with the appropriate division number.
While not all of these labels are permitted for use in Australia or New Zealand, they may be seen on imported containers.

For Divisions 1.1, 1.2, 1.3 and 1.5, enter division number (**), and compatibility group letter (*), when required.

For Divisions 1.4 and 1.6, enter compatibility group letter (*) when required.

IN AN EMERGENCY, IN AUSTRALIA CALL 000 | IN NEW ZEALAND CALL 111
The Australian & New Zealand Emergency Response Guidebook 2021 (ANZ-ERG2021) is published by the Competent Authorities Panel (CAP), a national body comprising state and territory Competent Authorities for the transport of dangerous goods by road and rail in Australia. CAP is established under state and territory legislation derived from the national Model Legislation – Transport of Dangerous Goods by Road or Rail.

ANZ-ERG2021 is made available free of charge and approved by CAP as emergency information satisfying the requirements of Chapter 11.2 of the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code).

ANZ-ERG2021 is substantially based on the CANUTEC 2020 Emergency Response Guidebook developed jointly by Transport Canada (TC), the U.S. Department of Transportation (DOT), the Secretariat of Transport and Communications of Mexico (SCT) and with the collaboration of CIQUIME (Centro de Información Química para Emergencias) of Argentina.

While the basic structure of the CANUTEC 2020 ERG has been retained, the following modifications have been made to ensure an appropriate fit for the Australian and New Zealand context:

- Modify spelling and measurements to suit Australia and New Zealand
- Inclusion of a guide for responding to a vehicle fire
- Removal or modification of technical information specific to Canada, North America and South America

ANZ-ERG2021 is primarily a guide to aid transport operators and first responders in quickly identifying the specific or generic hazards of the material involved in the incident, and protecting themselves and the general public during the initial response phase of the incident.

This guidebook will assist transport operators and responders in making decisions at the scene of a dangerous goods incident. It should not be considered as a substitute for emergency response training, knowledge or sound judgment. ANZ-ERG2021 does not address all possible circumstances that may be associated with a dangerous goods incident. It is primarily designed for use at a dangerous goods incident occurring on a highway or railroad. The ANZ-ERG2021 is not intended for responding to incidents at fixed facility locations.

ACKNOWLEDGEMENTS
I wish to acknowledge the efforts of the CAP Working Party and to thanks the following organisations:

- National Transport Commission
- Environmental Protection Authority NSW
- Waka Kotahi - NZ Transport Agency and Responsible Care NZ
- Australasian Fire and Emergency Services Authorities Council
- Department of Mines, Industry Regulation and Safety WA

The CAP Working Party also thanks CANUTEC for the generous provision of the original ERG2020 materials and permission to use this material for the ANZ-ERG2021

Peter Xanthis
Chair - Australian & New Zealand Emergency Response Guidebook Working Party
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SAFETY PRECAUTIONS – RESIST RUSHING IN!

RAISE THE ALARM
- Move upwind and get help
- If you are alone, raise the alarm before you take any action
- Help will arrive sooner and you will not be on your own, should you get into difficulties

APPROACH CAUTIOUSLY FROM UPWIND, UPHILL OR UPSTREAM:
- Stay clear of Vapour, Fumes, Smoke and Spills
- Keep vehicle at a safe distance from the scene

SECURE THE SCENE:
- Isolate the area and protect yourself and others

IDENTIFY THE HAZARDS USING ANY OF THE FOLLOWING:
- Placards
- Container labels
- Transport Documentation (Shipping documents)
- Rail Car and Road Trailer Identification Chart
- Safety Data Sheets (SDS)
- Knowledge of persons on scene
- Consult applicable guide page

ASSESS THE SITUATION:
- Is there a fire, a spill or a leak?
- What are the weather conditions?
- What is the terrain like?
- Who/what is at risk: people, property or the environment?
- What actions should be taken – evacuation, shelter in-place or dike?
- What resources (human and equipment) are required?
- What can be done immediately?

RESPOND:
- Enter only when wearing appropriate protective gear
- Rescue attempts and protecting property must be weighed against you becoming part of the problem
- Establish a command post and lines of communication
- Continually reassess the situation and modify response accordingly
- Consider safety of people in the immediate area first, including your own safety

ABOVE ALL: Do not assume that gases or vapours are harmless because of lack of a smell – odourless gases or vapours may be harmful. Use CAUTION when handling empty containers because they may still present hazards until they are cleaned and purged of all residues.

Refer to Isolation Information starting page 296.
NOTIFICATION AND REQUEST FOR TECHNICAL INFORMATION

Follow the steps outlined in your organisation’s local Transport Emergency Response Plan (TERP) for obtaining qualified assistance. Generally, the notification sequence and requests for technical information beyond what is available in this guidebook should occur in the following order:

1. **NOTIFY YOUR ORGANISATION/AGENCY**
   - Based on information provided, this will set in motion a series of events
   - Actions may range from dispatching additional trained personnel to the scene, to activating the local Transport Emergency Response Plan
   - Ensure that local fire and police departments have been notified

2. **CALL THE EMERGENCY RESPONSE TELEPHONE NUMBER ON THE TRANSPORT DOCUMENTATION (SHIPPING DOCUMENT) OR EMERGENCY INFORMATION PANEL**
   - If transport documentation is not available, notify the emergency services

3. **PROVIDE AS MUCH OF THE FOLLOWING INFORMATION AS POSSIBLE:**
   - Your name, call-back telephone number, fax number
   - Location and nature of problem (spill, fire, etc.)
   - Name and UN number of material(s) involved
   - Shipper/consignee/point-of-origin
   - Carrier name, rail car or truck number
   - Container type and size
   - Quantity of material transported/released
   - Local conditions (weather, terrain)
   - Proximity to schools, hospitals, waterways, etc.
   - Injuries and exposures
   - Local emergency services that have been notified

**POINTS TO CONSIDER IN THE MANAGEMENT OF AN EMERGENCY**

To manage a dangerous goods emergency effectively, many different questions need to be addressed by the first responder. Consider the following when at an incident site involving dangerous goods.

- **a)** Identify the products involved from any available documents. If not possible, identify the hazards from the vehicle or container placards.
- **b)** Minimise exposure to chemicals by working upwind (blowing from you to the incident). If possible, also approach from uphill. Wear appropriate protective clothing and avoid inhaling gases, fumes, and smoke.
- **c)** Use the information on the physical and chemical properties of the product to judge response
- **d)** Many chemicals lack colour or odour. Do not assume they are harmless.
- **e)** Remember that many gases are heavier than air.
- **f)** Decontaminate equipment, clothing and personnel on site if safe to do so.
- **g)** Dispose of contaminated equipment and materials only after receiving specialist advice
- **h)** Replenish used equipment
- **i)** If human exposure occurs, obtain medical assistance, ensuring full exposure details are advised.
The Hazchem Code is fully titled “Hazchem Emergency Action Code”. In European publications, it is now frequently referred to simply as “Emergency Action Code” or “EAC”.

The Hazchem Code advises on:

- Firefighting media
- Personal protection requirements
- Risk of violent reaction
- Spillage handling
- Evacuation consideration

A Hazchem Code offers guidance on appropriate initial emergency response in a potentially dangerous situation such as leakage, spillage or fire involving the dangerous goods to which it relates.

The Hazchem Code is composed of a number, followed by one or more letters

**EXTINGUISHING MEDIA**

The firefighting extinguishing media is determined by reference to the first character of the Hazchem Code as follows:

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Indicates coarse water spray</td>
</tr>
<tr>
<td>2</td>
<td>Indicates fine water spray</td>
</tr>
<tr>
<td>2</td>
<td>Indicates alcohol resistant foam is the preferred firefighting medium but, if not available, fine water spray can be used</td>
</tr>
<tr>
<td>3</td>
<td>Indicates normal foam (i.e. protein based foam that is not alcohol resistant)</td>
</tr>
<tr>
<td>3</td>
<td>Indicates alcohol resistant foam is preferred firefighting medium but, if not available normal foam can be used</td>
</tr>
<tr>
<td>4</td>
<td>Indicates dry agent (water must not be allowed to come in contact with substance)</td>
</tr>
</tbody>
</table>

**NOTE:** Any higher number than the one shown can be used, but a lower number must not be used.
A bullet ‘•’ sometimes precedes the number 2 or 3.

•2 and •3, have the following meanings:

•2 denotes that alcohol resistant foam is the preferred firefighting medium but, if it is not available, fine water spray can be used.

•3 denotes that alcohol resistant foam is the preferred firefighting medium but, if it is not available, normal foam can be used.

For example, the Hazchem Code assigned to UN 1193 Ethyl Methyl Ketone is •2YE. The ‘•’ here indicates to the emergency services that alcohol resistant foam is the preferred firefighting medium. However, if such foam is not available, fine water spray, as the next most effective medium, should be used.

### Meaning of Second Character of Hazchem Code

<table>
<thead>
<tr>
<th>Letter</th>
<th>Risk or violent reaction or explosion</th>
<th>Recommended personal protection</th>
<th>Appropriate measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Yes</td>
<td>Liquid-tight chemical</td>
<td>Dilute Due care must be taken to avoid unnecessary pollution of water courses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>protective clothing and breathing apparatus</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>No</td>
<td>Full fire kit and breathing apparatus</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>Yes</td>
<td>Liquid-tight chemical</td>
<td>Contain Prevent by any means available, spillage from entering drains and water course</td>
</tr>
<tr>
<td></td>
<td></td>
<td>protective clothing and breathing apparatus</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>No</td>
<td>Full fire kit and breathing apparatus</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>Yes</td>
<td>Liquid-tight chemical</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>protective clothing and breathing apparatus</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>No</td>
<td>Full fire kit and breathing apparatus</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>PUBLIC SAFETY HAZARD. People should be warned to stay indoors with all doors and windows closed, but evacuation may need to be considered. Consult Control, Police, and product experts.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Where the second character of the Hazchem Code is S, T, Y or Z, normal firefighting clothing is appropriate, i.e. self-contained open circuit positive pressure compressed air breathing apparatus, worn in combination with fire kit, firefighters’ gloves and firefighters’ boots.

Where the second character of the Hazchem Code is P, R, W or X, liquid-tight chemical protective clothing in combination with breathing apparatus specified.
Violent Reaction

Where the second character of a Hazchem Code is a P, S, W or Y there is a danger that the substance can be violently or explosively reactive. This danger may be present due to one of the following:

- Violent or explosive decomposition of the material involved, including ignition or friction.
- The ignition of a flammable gas or vapour cloud (this danger exists for all flammable gases and flammable liquids with a flash point below 60 °C)
- The rapid acceleration of combustion due to the involvement of an oxidiser.
- A reaction with water which is itself violent, and may also evolve flammable gases.

Contain/dilute

Where the second character of a Hazchem Code is W, X, Y or Z spillages and decontamination run-off should be prevented from entering drains and watercourses. Where the second character of the code is P, R, S or T spillages and decontamination run-off may be washed to drains with large quantities of water. Due care must however still be exercised to avoid unnecessary pollution of watercourses.

E “Public Safety Hazard”

An ‘E’ following the first two characters of a Hazchem Code indicates that there may be a public safety hazard outside the immediate area of the incident, and that the following actions should be considered. People should be warned to stay indoors with all doors and windows closed, but evacuation may need to be considered. Consult Incident Control, Police, and product experts.
HAZARD CLASSIFICATION SYSTEM

The hazard class of dangerous goods is indicated either by its class (or division) number or name. Placards are used to identify the class or division of a material. The hazard class or division number must be displayed in the lower corner of a placard and is required for both primary and subsidiary hazard classes and divisions, if applicable. For other than Class 7 placards, text indicating a hazard (for example, “CORROSIVE”) is not required. The hazard class or division number and subsidiary hazard classes or division numbers placed in parentheses (when applicable), must appear on the transport documentation.

Class 1 - Explosives
- Division 1.1 Explosives which have a mass explosion hazard
- Division 1.2 Explosives which have a projection hazard but not a mass explosion hazard
- Division 1.3 Explosives which have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard
- Division 1.4 Explosives which present no significant blast hazard
- Division 1.5 Very insensitive explosives with a mass explosion hazard
- Division 1.6 Extremely insensitive articles which do not have a mass explosion hazard

Class 2 - Gases
- Division 2.1 Flammable gases
- Division 2.2 Non-flammable, non-toxic* gases
- Division 2.3 Toxic* gases

Class 3 - Flammable liquids (and Combustible liquids)

Class 4 - Flammable solids; Substances liable to spontaneous combustion; Substances which, on contact with water, emit flammable gases
- Division 4.1 Flammable solids, self-reactive substances, solid desensitized explosives and polymerising substances.
- Division 4.2 Substances liable to spontaneous combustion
- Division 4.3 Substances which in contact with water emit flammable gases

Class 5 - Oxidizing substances and Organic peroxides
- Division 5.1 Oxidizing substances
- Division 5.2 Organic peroxides

Class 6 - Toxic* substances and Infectious substances
- Division 6.1 Toxic* substances
- Division 6.2 Infectious substances

Class 7 - Radioactive materials

Class 8 - Corrosive substances

Class 9 - Miscellaneous dangerous substances including environmentally hazardous substances

* The words “poison” or “poisonous” are synonymous with the word “toxic”.

IN AN EMERGENCY, IN AUSTRALIA CALL 000 | IN NEW ZEALAND CALL 111
Desensitised explosive

A desensitised explosive is an explosive substance that has had its explosive properties suppressed by:
- wetting the substance with water or alcohol, or
- diluting the substance by mixing with another non-explosive substance, or
- dissolving the substance in water, alcohol or other liquid, and
- packing the substance in such a way to be excluded from Class 1 by virtue of test results.

Subsidiary hazards

Many dangerous goods present more than one hazard. These goods are classified according to their primary hazard, and their additional hazards are called subsidiary hazards. A subsidiary hazard is identified on transport documentation and by the presence of more than one class or division label. All primary and sub-hazards must be considered when determining emergency response.

Packing Group (PG) = Degree of danger

Most dangerous goods of classes 3, 4, 8 and 9 and divisions 5.1 and 6.1 have been divided into three packing groups indicating the degree of danger presented by the substance. This information is shown on documentation in roman numerals. It is not required to be displayed on packaging and substance labels, but it is permitted and is common practice in New Zealand.

Packing Group I (PG I) High danger – substances that pose an immediate threat to life, health or property whenever there is a leak, spill or fire, even in very small quantities.

Packing Group II (PG II) Medium danger – substances that pose a significant threat in a fire or larger spill or leak. Flammable substances of PG II will ignite readily at ambient temperatures.

Packing Group III (PG III) Low danger – substances that are similar in hazard to many found in domestic situations. Flammable substances of PG III will usually be difficult to ignite at ambient temperatures. Generally, PG III substances pose a significant threat to health or property in open areas only when involved in a large fire or in a major spill or leak.

Note – Packing Groups are not assigned to self-reactive substances of Division 4.1 and articles of any class or division.
The following is intended to supply information to first responders for use in making a preliminary assessment of a situation that they suspect involves criminal/terrorist use of chemical, biological agents and/or radioactive materials (CBRN). To aid in the assessment, a list of observable indicators of the use and/or presence of a CB agent or radioactive material is provided in the following paragraphs. This section ends with a Safe Standoff Distance Chart for various threats when Improvised Explosive Devices are involved.

Differences between a Chemical, Biological and Radiological Agent

Chemical and biological agents as well as radioactive materials can be dispersed in the air we breathe, the water we drink, or on surfaces we physically contact. Dispersion methods may be as simple as opening a container, using conventional (garden) spray devices, or as elaborate as detonating an improvised explosive device.

Chemical Incidents are characterised by the rapid onset of medical symptoms (minutes to hours) and easily observed signatures (coloured residue, dead foliage, pungent odour, dead insects and animals).

Biological Incidents are characterised by the onset of symptoms in hours to days. Typically, there will be no characteristic signatures because biological agents are usually odourless and colourless. Because of the delayed onset of symptoms in a biological incident, the area affected may be greater due to the movement of infected individuals.

Radiological Incidents are characterized by the onset of symptoms, if any, in days to weeks or longer. Typically, there will be no characteristic signatures because radioactive materials are usually odourless and colourless. Specialized equipment is required to determine the size of the affected area, and whether the level of radioactivity presents an immediate or long-term health hazard. Because radioactivity is not detectable without special equipment, the affected area may be greater due to the migration of contaminated individuals.

The most probable sources would not generate enough radiation to kill people or cause severe illness. In a radiological incident generated by a dirty bomb, or Radiological Dispersal Device (RDD), in which a conventional explosive is detonated to spread radioactive contamination, the primary hazard is from the explosion. However, certain radioactive materials dispersed in the air could contaminate up to several city blocks, creating fear and possibly panic, and requiring potentially costly cleanup.

Indicators of a Possible Chemical Incident

Dead animals/birds/fish

Not just an occasional road kill, but numerous animals (wild and domestic, small and large), birds, and fish in the same area.

Lack of insect life

If normal insect activity (ground, air, and/or water) is missing, check the ground/water surface/shore line for dead insects. If near water, check for dead fish/aquatic birds.
INDICATORS OF A POSSIBLE CHEMICAL INCIDENT (Continued)

Unexplained odours

Smells may range from fruity to flowery to sharp/pungent to garlic/horseradish-like to bitter almonds/peach kernels to newly mown hay. It is important to note that the particular odour is completely out of character with its surroundings.

Unusual numbers of dying or sick people (mass casualties)

Health problems including nausea, disorientation, difficulty in breathing, convulsions, localized sweating, conjunctivitis (reddening of eyes/nerve agent symptoms), erythema (reddening of skin/vesicant symptoms) and death.

Pattern of casualties

Casualties will likely be distributed downwind, or if indoors, by the air ventilation system.

Blisters/rashes

Numerous individuals experiencing unexplained waterlike blisters, weals (like bee stings), and/or rashes.

Illness in confined area

Different casualty rates for people working indoors versus outdoors dependent on where the agent was released.

Unusual liquid droplets

Numerous surfaces exhibit oily droplets/film; numerous water surfaces have an oily film. No recent rain.)

Different-looking areas

Not just a patch of dead weeds, but trees, shrubs, bushes, food crops, and/or lawns that are dead, discoloured, or withered. (No current drought.)

Low-lying clouds

Low-lying cloud/fog-like condition that is not consistent with its surroundings.

Unusual metal debris

Unexplained bomb/munitions-like material, especially if it contains a liquid.

INDICATORS OF A POSSIBLE BIOLOGICAL INCIDENT

Unusual numbers of sick or dying people or animals

Any number of symptoms may occur. Casualties may occur hours to days after an incident has occurred. The time required before symptoms are observed is dependent on the agent used.

Unscheduled and unusual spray being disseminated

Especially if outdoors during periods of darkness.

Abandoned spray devices

Devices may not have distinct odours.
INDICATORS OF A POSSIBLE RADIOLOGICAL INCIDENT

Radiation Symbols
Containers may display a “propeller” radiation symbol.

Unusual metal debris
Unexplained bomb/munitions-like material.

Heat-emitting material
Material that is hot or seems to emit heat without any sign of an external heat source.

Glowing material
Strongly radioactive material may emit or cause radioluminescence.

Sick people/animals
In very improbable scenarios there may be unusual numbers of sick or dying people or animals. Casualties may occur hours to days or weeks after an incident has occurred. The time required before symptoms are observed is dependent on the radioactive material used, and the dose received. Possible symptoms include skin reddening or vomiting.

PERSONAL SAFETY CONSIDERATIONS
When approaching a scene that may involve CB agents or radioactive materials, the most critical consideration is the safety of oneself and other responders. Use protective clothing and respiratory protection of an appropriate level of safety.

In incidents where it is suspected that CBRN materials have been used as weapons, NIOSH-certified respirators with CBRN protection are highly recommended. Be aware that the presence and identification of CB agents or radioactive materials may not be verifiable, especially in the case of biological or radiological agents. The following actions/measures to be considered are applicable to either a chemical, biological or radiological incident. The guidance is general in nature, not all encompassing, and its applicability should be evaluated on a case-by-case basis.

Approach and response strategies.
- Minimise exposure time.
- Maximise the distance between you and the item that is likely to harm you.
- Use cover as protection.
- Wear appropriate personal protective equipment as respiratory protection.
- Identify and estimate the hazard by using the indicated above.
- Isolate and secure the area.
- Isolate and decontaminate potentially contaminated people as soon as possible.
- To the extent possible, take measures to limit the spread of contamination.

In the event of a chemical incident, the fading of chemical odours does not necessarily indicate reduced vapour concentrations. Some chemicals deaden the senses, giving you the false perception that the chemical is no longer present. If there is any indication that an area may be contaminated with radioactive materials, including the site of any non-accidental explosion, responder personnel should be equipped with radiation detection equipment that would alert them if they are entering a radiologically compromised environment, and should have received adequate training in its use. This equipment should be designed in such a way that it can also alert the responders when an unacceptable ambient dose rate or ambient dose has been reached.
Initial actions to consider in a potential CBRN/Hazmat Terrorism Event:

- Avoid using cell phones, radios, etc. within 100 metres (300 feet) of a suspect device.
- NOTIFY your local police by calling 000 in Australia or 111 in New Zealand.
- Set up Incident command upwind and uphill of the area.
- Do NOT touch or move suspicious packages/containers.
- Be cautious regarding potential presence of secondary devices (e.g. Improvised Explosive Devices (IEDs)).
- Avoid contamination.
- Limit access to only those responsible for rescue of victims or assessment of unknown materials or devices.
- Evacuate and isolate individuals potentially exposed to dangerous goods/hazardous materials.
- Isolate contaminated areas and secure the scene for analysis of material.

Decontamination measures.
For chemical and biological agents: Emergency responders should follow standard decontamination procedures (flush-strip-flush). Mass casualty decontamination should begin as soon as possible by stripping (all clothing) and flushing (soap and water).

For persons contaminated with radioactive material:
Take care to minimize the spread of contamination to the extent possible. Move them to a low radiation area if necessary and if it can be done safely. Remove their clothing and place it in a clearly marked and sealed receptacle, such as a plastic bag, for later testing. Use decontamination methods described above, but avoid breaking the skin, e.g., from shaving, or overly vigorous brushing. External radiological contamination on intact skin surface rarely causes a high enough dose to be a hazard to either the contaminated person or the first responders. For this reason, prioritise medical stabilisation for a contaminated individual.

Note: The above information was developed in part by the Department of National Defence (Canada), the U.S. Department of the Army, Aberdeen Proving Ground and the Federal Bureau of Investigation (FBI).
CLEAR COMMUNICATION

It is absolutely vital that the communication of incident details is accurate. The names of a number of chemicals can vary by only one or two letters, and they may sound similar, but their hazards may be widely different. To avoid confusion, the key item for transmitting chemical details should always be the UN number, which should be available from the transport documents. All information available should be transmitted. Whenever it is necessary to transmit names, it is strongly advised that the phonetic alphabet is used to avoid errors and ensure accurate spelling of product names.

PHONETIC ALPHABET

<table>
<thead>
<tr>
<th>Letter</th>
<th>Phonetic Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Alpha</td>
</tr>
<tr>
<td>B</td>
<td>Bravo</td>
</tr>
<tr>
<td>C</td>
<td>Charlie</td>
</tr>
<tr>
<td>D</td>
<td>Delta</td>
</tr>
<tr>
<td>E</td>
<td>Echo</td>
</tr>
<tr>
<td>F</td>
<td>Foxtrot</td>
</tr>
<tr>
<td>G</td>
<td>Golf</td>
</tr>
<tr>
<td>H</td>
<td>Hotel</td>
</tr>
<tr>
<td>I</td>
<td>India</td>
</tr>
<tr>
<td>J</td>
<td>Juliet</td>
</tr>
<tr>
<td>K</td>
<td>Kilo</td>
</tr>
<tr>
<td>L</td>
<td>Lima</td>
</tr>
<tr>
<td>M</td>
<td>Mike</td>
</tr>
<tr>
<td>N</td>
<td>November</td>
</tr>
<tr>
<td>O</td>
<td>Oscar</td>
</tr>
<tr>
<td>P</td>
<td>Papa</td>
</tr>
<tr>
<td>Q</td>
<td>Quebec</td>
</tr>
<tr>
<td>R</td>
<td>Romeo</td>
</tr>
<tr>
<td>S</td>
<td>Sierra</td>
</tr>
<tr>
<td>T</td>
<td>Tango</td>
</tr>
<tr>
<td>U</td>
<td>Uniform</td>
</tr>
<tr>
<td>V</td>
<td>Victor</td>
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<td>W</td>
<td>Whisky</td>
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<tr>
<td>X</td>
<td>X-ray</td>
</tr>
<tr>
<td>Y</td>
<td>Yankee</td>
</tr>
<tr>
<td>Z</td>
<td>Zulu</td>
</tr>
</tbody>
</table>

Example – Chemical name NITRIC ACID would be spelled out as:

N November
I India
T Tango
R Romeo
I India
C Charlie
A Alpha
C Charlie
I India
D Delta
GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELING OF CHEMICALS (GHS)

In some cases, such as on drums or intermediate bulk containers (IBCs), which must address information for all sectors, the GHS label may be found in addition to the required transport labels and placards. Both types of labels (GHS and transport) will differ in a way that will make them easy to identify during an emergency.

The GHS is a system used to classify and communicate chemical hazards using internationally consistent terms and information on chemical labels and Safety Data Sheet (SDS). While the GHS provides for a single system, it is intended for users of chemicals and is specific to workplace legislation; it does not replace dangerous goods classification and labelling requirements for transport.

In the GHS, hazards are communicated to chemical users through a combination of symbols (pictograms) as well as words, in the form of signal words, hazard statements and precautionary statements. These are intended to appear on labels and in SDS.

Dangerous goods markings and labels are aimed at preventing and mitigating incidents related to the transport of dangerous goods and provide information for preventing and responding to emergencies that occur in transit.
<table>
<thead>
<tr>
<th>GHS Pictograms</th>
<th>Physical hazards</th>
<th>Health and Environmental hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosive; Self-reactive; Organic peroxide</td>
<td>Skin corrosion; Serious eye damage</td>
<td></td>
</tr>
<tr>
<td>Flammable; Pyrophoric; Self-reactive; Organic peroxide; Self-heating; Emits flammable gases when in contact with water</td>
<td>Acute toxicity (harmful); Skin sensitizer; Irritant (skin and eye); Narcotic effect; Respiratory tract irritant; Hazardous to ozone layer (environment)</td>
<td></td>
</tr>
<tr>
<td>Oxidizer</td>
<td>Respiratory sensitizer; Mutagen; Carcinogen; Reproductive toxicity; Target organ toxicity; Aspiration hazard</td>
<td></td>
</tr>
<tr>
<td>Gas under pressure</td>
<td>Hazardous to aquatic environment</td>
<td></td>
</tr>
<tr>
<td>Corrosive to metals</td>
<td>Acute toxicity (fatal or toxic)</td>
<td></td>
</tr>
</tbody>
</table>
HAZARD IDENTIFICATION NUMBERS DISPLAYED ON SOME INTERMODAL CONTAINERS

Hazard identification numbers, utilized under European and some South American regulations, may be found in the top half of an orange panel on some intermodal bulk containers. The United Nations 4-digit identification number is in the bottom half of the orange panel.

ADR EXPLANATION

The upper half contains the ADR Hazard Identification Number (or Kemler Code) which indicates the properties of the substance involved.

The ADR Hazard Identification Number consists of two or three digits. The first digit indicates the primary hazard, the second and third digit generally indicate secondary hazards.

- Doubling of a digit indicates an intensification of that particular hazard. (i.e., 33, 66, 88)
- Where the hazard associated with a substance can be adequately indicated by a single figure, this is followed by a zero. (i.e., 30, 40, 50)
- A hazard identification number prefixed by the letter 'X', indicates that the substance will react dangerously with water. (i.e., X88)

<table>
<thead>
<tr>
<th>The first digit/letter indicates the primary hazard</th>
<th>The second and third digits generally secondary hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Emission of gas due to pressure or chemical reaction</td>
<td>0 the hazard is adequately described by the first digit</td>
</tr>
<tr>
<td>3 Flammability of liquids (vapours) and gases or self-heating liquid</td>
<td>2 (flammable) gas may be given off</td>
</tr>
<tr>
<td>4 Flammability of solids or self-heating solid</td>
<td>3 fire risk</td>
</tr>
<tr>
<td>5 Oxidising (fire-intensifying) effect</td>
<td>4 fire risk</td>
</tr>
<tr>
<td>6 Toxicity</td>
<td>5 oxidising risk</td>
</tr>
<tr>
<td>7 Radioactivity</td>
<td>6 toxic risk</td>
</tr>
<tr>
<td>8 Corrosivity</td>
<td>8 corrosive risk</td>
</tr>
<tr>
<td>9 Risk of spontaneous violent reaction</td>
<td>9 risk of spontaneous violent reaction</td>
</tr>
<tr>
<td>X Reacts dangerously with water</td>
<td></td>
</tr>
</tbody>
</table>

IN AN EMERGENCY, IN AUSTRALIA CALL 000 | IN NEW ZEALAND CALL 111
GREEN HIGHLIGHTED ENTRIES IN YELLOW PAGES

For entries highlighted in green follow these steps:

- **IF THERE IS NO FIRE:**
  - Go directly to Table 1 (green bordered pages)
  - Look up the UN number and name of material
  - Identify initial isolation and protective action distances

- **IF A FIRE IS INVOLVED:**
  - Use the appropriate Orange Guide for EVACUATION distances
  - Also protect in downwind direction according to Table 1 for residual material release

**Note 1:** If the name in Table 1 is shown with "*(when spilled in water)*", these materials produce large amounts of Toxic Inhalation Hazard (TIH) (PIH in the US) gases when spilled in water. Some Water Reactive materials are also TIH materials themselves (e.g., Bromine trifluoride (UN1746), Thionyl chloride (UN1836), etc.). In these instances, two entries are provided in Table 1 for land-based and water-based spills. If the Water Reactive material is NOT a TIH and this material is NOT spilled in water, Table 1 and Table 2 do NOT apply and safety distances will be found within the appropriate orange guide.

**Note 2:** Explosives are not individually listed by their UN number because in an emergency situation, the response will be based only on the division of the explosive, not on the individual explosive.

- For divisions 1.1, 1.2, 1.3 and 1.5, refer to GUIDE 112.
- For divisions 1.4 and 1.6, refer to GUIDE 114.

**Note 3:** Chemical warfare agents do not have an assigned UN number because they are not commercially transported. In an emergency situation, the assigned orange guide will provide guidance for the initial response. Also consult “Criminal or Terrorist Use of Chemical, Biological and Radiological Agents”, pp. 368 to 372.
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ammonium nitrate-fuel oil mixtures</td>
<td>1015</td>
<td>126</td>
<td>Carbon dioxide and Nitrous oxide mixture</td>
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<tr>
<td></td>
<td></td>
<td>Biological agents</td>
<td>1015</td>
<td>126</td>
<td>Nitrous oxide and Carbon dioxide mixture</td>
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<tr>
<td></td>
<td>158</td>
<td>Blasting agent, n.o.s.</td>
<td>1016</td>
<td>119</td>
<td>Carbon monoxide</td>
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<tr>
<td></td>
<td>112</td>
<td>Explosives, division 1.1, 1.2, 1.3 or 1.5</td>
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<td>119</td>
<td>Carbon monoxide, compressed</td>
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<tr>
<td></td>
<td></td>
<td>Explosives, division 1.4 or 1.6</td>
<td>1017</td>
<td>124</td>
<td>Chlorine</td>
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<td></td>
<td>153</td>
<td>Toxins</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1001</td>
<td>116</td>
<td>Acetylene, dissolved</td>
<td>1018</td>
<td>126</td>
<td>Chlorodifluoromethane</td>
</tr>
<tr>
<td>1002</td>
<td>122</td>
<td>Air, compressed</td>
<td>1018</td>
<td>126</td>
<td>Refrigerant gas R-22</td>
</tr>
<tr>
<td>1003</td>
<td>122</td>
<td>Air, refrigerated liquid (cryogenic liquid)</td>
<td>1020</td>
<td>126</td>
<td>Chloropentafluoroethane</td>
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<tr>
<td>1003</td>
<td>122</td>
<td>Air, refrigerated liquid (cryogenic liquid), non-pressurised</td>
<td>1020</td>
<td>126</td>
<td>Refrigerant gas R-115</td>
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<tr>
<td>1005</td>
<td>125</td>
<td>Ammonia, anhydrous</td>
<td>1021</td>
<td>126</td>
<td>1-Chloro-1,2,2,2-tetrafluoroethane</td>
</tr>
<tr>
<td>1005</td>
<td>125</td>
<td>Anhydrous ammonia</td>
<td>1021</td>
<td>126</td>
<td>Refrigerant gas R-124</td>
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<td>1006</td>
<td>120</td>
<td>Argon</td>
<td>1022</td>
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<td>Chlorotrifluoromethane</td>
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<tr>
<td>1006</td>
<td>120</td>
<td>Argon, compressed</td>
<td>1022</td>
<td>126</td>
<td>Refrigerant gas R-13</td>
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<tr>
<td>1008</td>
<td>125</td>
<td>Boron trifluoride</td>
<td>1023</td>
<td>119</td>
<td>Coal gas</td>
</tr>
<tr>
<td>1008</td>
<td>125</td>
<td>Boron trifluoride, compressed</td>
<td>1023</td>
<td>119</td>
<td>Coal gas, compressed</td>
</tr>
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<td>126</td>
<td>Bromotrifluoromethane</td>
<td>1026</td>
<td>119</td>
<td>Cyanogen</td>
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<td>1009</td>
<td>126</td>
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<td>1027</td>
<td>115</td>
<td>Cyclopropane</td>
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<td>116P</td>
<td>Butadienes, stabilised</td>
<td>1028</td>
<td>126</td>
<td>Dichlorodifluoromethane</td>
</tr>
<tr>
<td>1010</td>
<td>116P</td>
<td>Butadienes and hydrocarbon mixture, stabilised</td>
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<td>126</td>
<td>Refrigerant gas R-12</td>
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<tr>
<td>1010</td>
<td>116P</td>
<td>Hydrocarbon and butadienes mixture, stabilised</td>
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<td>126</td>
<td>Dichlorofluoromethane</td>
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<td>115</td>
<td>Butane</td>
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<tr>
<td>1012</td>
<td>115</td>
<td>Butylene</td>
<td>1030</td>
<td>115</td>
<td>1,1-Difluoroethane</td>
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<td>120</td>
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<td>1030</td>
<td>115</td>
<td>Refrigerant gas R-152a</td>
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<td>120</td>
<td>Carbon dioxide, compressed</td>
<td>1032</td>
<td>118</td>
<td>Dimethylamine, anhydrous</td>
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<tr>
<td>1014</td>
<td>122</td>
<td>Carbon dioxide and Oxygen mixture, compressed</td>
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<td>115</td>
<td>Dimethyl ether</td>
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<tr>
<td>1014</td>
<td>122</td>
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<td>1035</td>
<td>115</td>
<td>Ethane</td>
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<td>1035</td>
<td>115</td>
<td>Ethane, compressed</td>
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<td>1036</td>
<td>118</td>
<td>Ethylamine</td>
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<td>1037</td>
<td>115</td>
<td>Ethyl chloride</td>
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<td></td>
<td></td>
<td></td>
<td>1038</td>
<td>115</td>
<td>Ethylene, refrigerated liquid (cryogenic liquid)</td>
</tr>
</tbody>
</table>

IN AN EMERGENCY, IN AUSTRALIA CALL 000 | IN NEW ZEALAND CALL 111
<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide No.</th>
<th>Name of Material</th>
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</thead>
<tbody>
<tr>
<td>1039</td>
<td>115</td>
<td>Ethyl methyl ether</td>
</tr>
<tr>
<td>1039</td>
<td>115</td>
<td>Methyl ethyl ether</td>
</tr>
<tr>
<td>1040</td>
<td>119P</td>
<td>Ethylene oxide</td>
</tr>
<tr>
<td>1040</td>
<td>119P</td>
<td>Ethylene oxide with Nitrogen</td>
</tr>
<tr>
<td>1041</td>
<td>115</td>
<td>Carbon dioxide and Ethylene oxide mixture, with more than 9% but not more than 87% Ethylene oxide</td>
</tr>
<tr>
<td>1041</td>
<td>115</td>
<td>Ethylene oxide and Carbon dioxide mixture, with more than 9% but not more than 87% Ethylene oxide</td>
</tr>
<tr>
<td>1043</td>
<td>125</td>
<td>Fertilizer, ammoniating solution, with free Ammonia</td>
</tr>
<tr>
<td>1044</td>
<td>126</td>
<td>Fire extinguishers with compressed gas</td>
</tr>
<tr>
<td>1044</td>
<td>126</td>
<td>Fire extinguishers with liquefied gas</td>
</tr>
<tr>
<td>1045</td>
<td>124</td>
<td>Fluorine</td>
</tr>
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<td>1045</td>
<td>124</td>
<td>Fluorine, compressed</td>
</tr>
<tr>
<td>1046</td>
<td>120</td>
<td>Helium</td>
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<tr>
<td>1046</td>
<td>120</td>
<td>Helium, compressed</td>
</tr>
<tr>
<td>1048</td>
<td>125</td>
<td>Hydrogen bromide, anhydrous</td>
</tr>
<tr>
<td>1049</td>
<td>115</td>
<td>Hydrogen</td>
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<td>115</td>
<td>Hydrogen, compressed</td>
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<td>125</td>
<td>Hydrogen chloride, anhydrous</td>
</tr>
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<td>AC</td>
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<td>117P</td>
<td>Hydrocyanic acid, aqueous solutions, with more than 20% Hydrogen cyanide</td>
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<td>117P</td>
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<td>117P</td>
<td>Hydrogen cyanide, stabilised</td>
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<td>125</td>
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</tr>
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<td>117</td>
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<td>Krypton</td>
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<tr>
<td>1056</td>
<td>120</td>
<td>Krypton, compressed</td>
</tr>
<tr>
<td>1057</td>
<td>115</td>
<td>Lighter refills (cigarettes) (flammable gas)</td>
</tr>
<tr>
<td>1057</td>
<td>115</td>
<td>Lighters (cigarettes) (flammable gas)</td>
</tr>
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<td>1057</td>
<td>128</td>
<td>Lighters, non-pressurised, containing flammable liquid</td>
</tr>
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<td>1058</td>
<td>120</td>
<td>Liquefied gases, non-flammable, charged with Nitrogen, Carbon dioxide or Air</td>
</tr>
<tr>
<td>1060</td>
<td>116P</td>
<td>Methylacetylene and Propadiene mixture, stabilised</td>
</tr>
<tr>
<td>1060</td>
<td>116P</td>
<td>Propadiene and Methylacetylene mixture, stabilised</td>
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<td>1061</td>
<td>118</td>
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<td>1062</td>
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<td>1063</td>
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<td>Methyl chloride</td>
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<td>Neon</td>
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<td>120</td>
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<td>Nitrogen</td>
</tr>
<tr>
<td>1066</td>
<td>120</td>
<td>Nitrogen, compressed</td>
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<tr>
<td>1067</td>
<td>124</td>
<td>Dinitrogen tetroxide</td>
</tr>
<tr>
<td>1067</td>
<td>124</td>
<td>Nitrogen dioxide</td>
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<td>1069</td>
<td>125</td>
<td>Nitrosyl chloride</td>
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<td>1070</td>
<td>122</td>
<td>Nitrous oxide</td>
</tr>
<tr>
<td>1070</td>
<td>122</td>
<td>Nitrous oxide, compressed</td>
</tr>
<tr>
<td>1071</td>
<td>119</td>
<td>Oil gas</td>
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IN AN EMERGENCY, IN AUSTRALIA CALL 000 | IN NEW ZEALAND CALL 111
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<td>Acetic acid, solution, more than 10% but not more than 80% acid</td>
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<td>Poisonous by inhalation liquid, corrosive, flammable, n.o.s. (Inhalation Hazard Zone A)</td>
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<td>Toxic by inhalation liquid, corrosive, flammable, n.o.s. (Inhalation Hazard Zone B)</td>
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<td>Petroleum sour crude oil, flammable, poisonous</td>
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<td>Batteries, nickel-metal hydride</td>
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IN AN EMERGENCY, IN AUSTRALIA CALL 000 | IN NEW ZEALAND CALL 111
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<td>Lithium batteries installed in cargo transport unit (lithium ion batteries)</td>
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GREEN HIGHLIGHTED ENTRIES IN BLUE PAGES

For entries highlighted in green follow these steps:

• **IF THERE IS NO FIRE:**
  - Go directly to Table 1 (green-bordered pages)
  - Look up the UN number and name of material
  - Identify initial isolation and protective action distances

• **IF A FIRE IS INVOLVED:**
  - Use the appropriate Orange Guide for EVACUATION distances
  - Also protect in downwind direction according to Table 1 for residual material release

**Note 1:** If the name in Table 1 is shown with “**(when spilled in water)**”, these materials produce large amounts of Toxic Inhalation Hazard (TIH) gases when spilled in water. Some Water Reactive materials are also TIH materials themselves (e.g., Bromine trifluoride (UN1746), Thionyl chloride (UN1836), etc.). In these instances, two entries are provided in Table 1 for land-based and water-based spills. If the Water Reactive material is **NOT** a TIH and this material is **NOT** spilled in water, Table 1 and Table 2 do **NOT** apply and safety distances will be found within the appropriate orange guide.

**Note 2:** Explosives are not individually listed by their name because in an emergency situation, the response will be based only on the division of the explosive, not on the individual explosive.

  For divisions 1.1, 1.2, 1.3 and 1.5, refer to GUIDE 112.
  For divisions 1.4 and 1.6, refer to GUIDE 114.

**Note 3:** Chemical warfare agents do not have an assigned UN number because they are not commercially transported. In an emergency situation, the assigned orange guide will provide guidance for the initial response.
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Zinc hydrosulfite 171 1931

Zinc hydrosulphite 171 1931

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Zinc permanganate 140 1515
Zinc peroxide 143 1516
Zinc phosphide 139 1714
Zinc powder 138 1436
Zinc residue 138 1435
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Zinc silicofluoride 151 2855
Zinc skimmings 138 1435
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Zirconium hydride 138 1437
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Zirconium tetrachloride 137 2503
**GUIDE NUMBER AND TITLE**
- The guide title identifies the general hazards associated with the materials in this Guide.

**POTENTIAL HAZARDS**
- Emergency responders should consult this section first!
- Describes the material hazard in terms of FIRE OR EXPLOSION and HEALTH effects upon exposure.
- The primary potential hazard is listed first.
- Allows the responders to make decisions to protect the emergency response team, and the surrounding population.
3 PUBLIC SAFETY

- This section is divided into three subsections:
  - **General Information**: describes initial precautionary measures to be taken by those first on the scene.
  - **PROTECTIVE CLOTHING**: provides general guidance on personal protective equipment requirements including respiratory protection. The protective clothing information is general and correct selection is situation dependent, after considering the physical and chemical properties of the material, weather conditions, spill versus fire, topography, etc.
  - **EVACUATION**: suggests protective distances for immediate precautionary measures defined for small and large spills, including suggested guidance for conditions where fire is present or likely (potential fragmentation hazard).
    - The term “isolate” indicates a zone of no entry that applies to the public and first responders who are not equipped, trained, and prepared to mitigate the incident.
    - The term “evacuate” indicates people should be removed from inside this zone, if it can be done safely. If removal is too risky, sheltering-in-place can also be considered in this zone. Evacuation aims to protect as many people as possible, and applies mainly to the public.
- Materials highlighted in green in the yellow-bordered and blue-bordered pages direct the reader to consult Table 1, detailing specific response distances for toxic inhalation hazard materials, water-reactive materials and chemical warfare agents (green-bordered pages).

4 EMERGENCY RESPONSE

- This section is divided into three subsections:
  - **FIRE**: provides extinguishing procedures for Small Fire, Large Fire, and/or Fire Involving Tanks or Car/Trailer Loads
  - **SPILL OR LEAK**: includes general recommendations, and may describe the response procedure for Small Spill and Large Spill
  - **FIRST AID**: provides general guidance prior to seeking expert medical care.
INHALED
- If overcome by smoke or fumes, remove victim to fresh air.
- Apply resuscitation if victim is not breathing. Administer oxygen if breathing is difficult.
- Keep victim warm and quiet.
- Obtain immediate medical care.

EYES
- Hold eyelids open and flush with clean, running water (if available) for at least 15 minutes.
- Remove any contact lenses.
- Obtain immediate medical care.

FIRE BURNS
- Immerse or flood affected area with cold water for at least 15 minutes.
- Bandage lightly with sterile dressing.
- Treat for shock if necessary.
- Do not forcibly separate skin from any adhering material.
- Obtain immediate medical care.

EMERGENCY RESPONSE

ENGINE FIRE
- Shut off engine and any electrical equipment and leave 'off'.
- Use fire extinguisher provided in the vehicle.
- Inject the contents through any available opening, without raising the bonnet if possible.
- If necessary, extinguish blaze with sand, earth, or large amounts of water.
- If unable to control fire, evacuate the immediate area and keep upwind.
- Contact police and local fire brigade. Tell them location and condition of vehicle and any damage observed. Advise of dangerous goods in load.
- Warn other traffic.

CABIN FIRE
- Shut off engine and any electrical equipment and leave 'off'.
- If safe to do so, remove burning materials.
- Beware of toxic fumes from burning upholstery.
- Use fire extinguisher provided in the vehicle.
- If necessary, extinguish blaze with sand, earth or large amounts of water.
- If unable to control fire, evacuate the immediate area and keep upwind.
- Contact police and local fire brigade. Tell them location and condition of vehicle and any damage observed. Advise of dangerous goods in load.
- Warn other traffic.
### CARGO FIRE
- Shut off engine and any electrical equipment and leave 'off'.
- Where the cargo requires special procedures, refer to the HAZCHEM code on the EIP or SDS for the substances involved.
- Use personal protective equipment (PPE) on vehicle.
- Use fire extinguisher provided with the vehicle.
- If necessary, extinguish blaze with sand, earth or (if HAZCHEM code permits) large amounts of water.
- If safe to do so, remove butning materials from cargo or remove other materials from area of fire. If no, keep good cool by spraying with water.
- If unable to control fire, evacuate the immediate area and keep upwind.
- Contact police and local fire brigade. Tell them location material, quantity, UN Number and emergency contact, as well as condition of vehicle and any damage observed.
- Warn other traffic.

### TYRE FIRE
- Stop vehicle. Assess fire and its extent in relation to load and hazards.
- Use fire extinguisher provided in the vehicle. Consider flooding the tyre with water if available.
- If possible change tyre and place it at least 15 metres from the vehicle, in an area free from combustible material; the tyre could re-ignite
  **If fire cannot be put out or tyre cannot be removed:**
  - If tyre is on prime mover, and if safe to do so, consider dropping the trailer and carefully driving the prime mover to a nearby safe location.
  - Consider driving again, carefully, until burning rubber is thrown off.
  - If fire persists after the above measures have been taken:
  - If unable to control fire, evacuate the immediate area and keep upwind.
  - Contact police and local fire brigade. Tell them location and condition of vehicle and any damage observed. Advise of dangerous goods in load.
  - Warn other traffic.

### BRAKE OVERHEATING
- Stop vehicle. Assess fire and its extent in relation to load and hazards. Allow brake to cool.
- **Only use extinguisher or water if there is a fire or immediate danger of fire**
  Do not drive the vehicle until the braking system has been inspected by a competent person and, if necessary, repaired.
- **If an uncontrolled fire develops:**
  - Evacuate the immediate area and keep upwind.
  - Contact police and local fire brigade. Tell them location and condition of vehicle and any damage observed. Advise of dangerous goods in load.
  - Warn other traffic.
POTENTIAL HAZARDS

FIRE OR EXPLOSION
- May explode from heat, shock, friction or contamination.
- May react violently or explosively on contact with air, water or foam.
- May be ignited by heat, sparks or flames.
- Vapours may travel to source of ignition and flash back.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

HEALTH
- Inhalation, ingestion or contact with substance may cause severe injury, infection, disease or death.
- High concentration of gas may cause asphyxiation without warning.
- Contact may cause burns to skin and eyes.
- Fire or contact with water may produce irritating, toxic and/or corrosive gases.
- Runoff from fire control may cause pollution.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Document first. If Transport Document not available or no answer, refer to appropriate telephone number listed on the inside back cover.
- As an immediate precautionary measure, isolate spill or leak area for at least 100 metres (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations.

EVACUATION

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE
CAUTION: Material may react with extinguishing agent.

Small Fire
- Dry chemical, CO₂, water spray or regular foam.

Large Fire
- Water spray, fog or regular foam.
- Move containers from fire area if you can do it without risk.

Fire involving Tanks
- Cool containers with flooding quantities of water until well after fire is out.
- Do not get water inside containers.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
- Do not touch or walk through spilled material.
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Keep combustibles (wood, paper, oil, etc.) away from spilled material.
- Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
- Prevent entry into waterways, sewers, basements or confined areas.

Small Spill
- Pick up with sand or other non-combustible absorbent material and place into containers for later disposal.

Large Spill
- Dike far ahead of liquid spill for later disposal.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Shower and wash with soap and water.
- Keep victim calm and warm.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
## POTENTIAL HAZARDS

### FIRE OR EXPLOSION
- MAY EXPLODE AND THROW FRAGMENTS 1600 METRES (1 MILE) OR MORE IF FIRE REACHES CARGO.
- For information on “Compatibility Group” letters, refer to Glossary section.

### HEALTH
- Fire may produce irritating, corrosive and/or toxic gases.

### PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- Isolate spill or leak area immediately for at least 500 metres (1/3 mile) in all directions.
- Move people out of line of sight of the scene and away from windows.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate closed spaces before entering.

### PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters’ protective clothing will provide thermal protection, but provides on limited chemical protection.

### EVACUATION

**Immediate Precautionary measure**

**Large Spill**
- Consider initial EVACUATION for 800 metres (1/2 mile) in all directions.

**Fire**
- If rail car or trailer is involved in a fire, ISOLATE for 1600 metres (1 mile) in all directions; also, initiate evacuation including emergency responders for 1600 metres (1 mile) in all directions.

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* For information on “Compatibility Group” Letters, refer to the Glossary section.
EMERGENCY RESPONSE

FIRE

CARGO Fire
- DO NOT fight fire when fire reaches cargo! Cargo may EXPLODE!
- Stop all traffic and clear the area for at least 1600 metres (1 mile) in all directions and let burn.
- Do not move cargo or vehicle if cargo has been exposed to heat.

TIRE or VEHICLE Fire
- Use plenty of water - FLOOD it! If water is not available, use CO₂, dry chemical or dirt.
- If possible, and WITHOUT RISK, use unmanned hose holders or monitor nozzles from maximum distance to prevent fire from spreading to cargo area.
- Pay special attention to tire fires as re-ignition may occur. Stand by, at a safe distance, with extinguisher ready for possible re-ignition.

SPILL OR LEAK
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- DO NOT OPERATE RADIO TRANSMITTERS WITHIN 100 METRES (330 FEET) OF ELECTRIC DETONATORS.
- DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
**POTENTIAL HAZARDS**

**FIRE OR EXPLOSION**
- Flammable/combustible material.
- May be ignited by heat, sparks or flames.
- DRIED OUT material may explode if exposed to heat, flame, friction or shock; treat as an explosive (GUIDE 112).
- Keep material wet with water or treat as an explosive (GUIDE 112).
- Runoff to sewer may create fire or explosion hazard.

**HEALTH**
- Some are toxic and may be fatal if inhaled, swallowed or absorbed through skin. Specifically, Dinitrophenol wetted (UN1320) sodium dinitro-o- cresolate, wetted (UN1348) and Barium Azide, wetted (UN1571) are known to be toxic.
- Contact may cause burns to skin and eyes.
- Fire may produce irritating, corrosive and/or toxic gases.
- Runoff from fire control or dilution water may cause pollution.

**PUBLIC SAFETY**
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- Isolate spill or leak area immediately for at least 100 metres (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate closed spaces before entering.

**PROTECTIVE CLOTHING**
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters’ protective clothing will provide thermal protection but provides only limited chemical protection.

**EVACUATION**

**Immediate precautionary measure**

**Large Spill**
- Consider initial EVACUATION for 500 metres (1/3 mile) in all directions.

**Fire**
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

CARGO Fire
• DO NOT fight fire when fire reaches cargo! Cargo may EXPLODE!
• Stop all traffic and clear the area for at least 1600 metres (1 mile) in all directions and let burn.
• Do not move cargo or vehicle if cargo has been exposed to heat.

TIRE or VEHICLE Fire
• Use plenty of water - FLOOD it! If water is not available, use CO₂, dry chemical or dirt.
• If possible, and WITHOUT RISK, use unmanned hose holders or monitor nozzles from maximum distance to prevent fire from spreading to cargo area.
• Pay special attention to tire fires as re-ignition may occur. Stand by, at a safe distance, with extinguisher ready for possible re-ignition.

SPILL OR LEAK
• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
• All equipment used when handling the product must be grounded.
• Do not touch or walk through spilled material.

Small Spill
• Flush area with flooding quantities of water.

Large Spill
• Wet down with water and dike for later disposal.
• KEEP “WETTED” PRODUCT WET BY SLOWLY ADDING FLOODING QUANTITIES OF WATER.

FIRST AID
• Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
• Move victim to fresh air.
• Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
• Give artificial respiration if victim is not breathing.
• Administer oxygen if breathing is difficult.
• Remove and isolate contaminated clothing and shoes.
• In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
Guide 114

Explosives* - Division 1.4 or 1.6

POTENTIAL HAZARDS

FIRE OR EXPLOSION

- May explode and throw fragments 800 metres (1/2 mile) or more if fire reaches cargo.

- For information on Compatibility Group letters, refer to Glossary section.

HEALTH

- Fire may produce irritating, corrosive and/or toxic gases.

PUBLIC SAFETY

- Call emergency response telephone number on transport documents first. If transport documents are not available or no answer, refer to appropriate emergency service.

- Move people out of line of sight of the scene and away from windows.

- Keep unauthorized personnel away.

- Stay upwind, uphill and/or upstream.

- Ventilate closed spaces before entering, but only if properly trained and equipped.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).

- Structural firefighters' protective clothing will provide thermal protection but provides only limited chemical protection.

EVACUATION

Immediate precautionary measure

- Isolate spill or leak area immediately for at least 100 metres (330 feet) in all directions.

Large Spill

- Consider initial EVACUATION for 250 metres (800 feet) in all directions.

Fire

- If rail car or trailer is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also initiate evacuation including emergency responders for 800 metres (1/2 mile) in all directions.

- If fire threatens cargo area containing packages bearing the 1.4S label or packages containing material classified as 1.4S, consider isolating at least 15 metres (50 feet) in all directions.

* For information on "Compatibility Group" letters, refer to the Glossary section.
EMERGENCY RESPONSE

FIRE

CARGO Fire
• DO NOT fight fire when fire reaches cargo! Cargo may EXPLODE!
• Stop all traffic and clear the area for at least 800 metres (1/2 mile) in all directions and let burn.
• Do not move cargo or vehicle if cargo has been exposed to heat.

TYRE or VEHICLE Fire
• Use plenty of water - FLOOD it! If water is not available, use CO₂, dry chemical or dirt.
• If possible, and WITHOUT RISK, use unmanned hose holders or monitor nozzles from maximum distance to prevent fire from spreading to cargo area.
• If fire cannot be prevented from involving cargo, treat cargo fire and evacuate in all directions for at least 800 metres (1/2 mile) in all directions and let burn.
• Pay special attention to tyre fires as re-ignition may occur. Stand by, at a safe distance, with extinguisher ready for possible re-ignition.

CLASS 1.4S Fire
• Packages bearing the 1.4S label or packages containing material classified as 1.4S are designed or packaged in such a manner that when involved in a fire, they may burn vigorously with localised detonation and projection of fragments
• Effects are usually confined to immediate vicinity of packages
• Fight fire with normal precautions from a reasonable distance.

SPILL OR LEAK
• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
• All equipment used when handling the product must be grounded.
• Do not touch or walk through spilled material.
• DO NOT OPERATE RADIO TRANSMITTERS WITHIN 100 METRES (330 FEET) OF ELECTRIC DETONATORS.
• DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.

FIRST AID
• Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
• Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
• Move victim to fresh air if it can be done safely.
• Give artificial respiration if victim is not breathing.
• Administer oxygen if breathing is difficult.
• Remove and isolate contaminated clothing and shoes.
• In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.

SUPPLEMENTAL INFORMATION
• Packages bearing the 1.4S label or packages containing material classified as 1.4S are designed or packaged in such a manner that when involved in a fire, they may burn vigorously with localized detonations and projection of fragments.
• Effects are usually confined to immediate vicinity of packages.
• If fire threatens cargo area containing packages bearing the 1.4S label or packages containing material classified as 1.4S, consider isolating at least 15 metres (50 feet) in all directions. Fight fire with normal precautions from a reasonable distance.
POTENTIAL HAZARDS

FIRE OR EXPLOSION

• EXTREMELY FLAMMABLE
  • Will be easily ignited by heat, sparks or flames.
  • Will form explosive mixtures with air.
  • Vapours from liquefied gas are initially heavier than air and spread along ground.

CAUTION: Hydrogen (UN1049), Deuterium (UN1957), Hydrogen, refrigerated liquid (UN1966), Methane (UN1971) and Hydrogen and Methane mixture, compressed (UN2034) are lighter than air and will rise. Hydrogen and Deuterium fires are difficult to detect since they burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.)

• Vapours may travel to source of ignition and flash back.
• Containers exposed to fire may vent and release flammable gas through pressure relief devices.
• Containers may explode when heated.
• Ruptured cylinders may rocket.

HEALTH

• Vapours may cause dizziness or asphyxiation without warning.
• Some may be irritating if inhaled at high concentrations.
• Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
• Fire may produce irritating and/or toxic gases.

PUBLIC SAFETY

• CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
• As an immediate precautionary measure, isolate spill or leak area for at least 100 metres (330 feet) in all directions.
• Keep unauthorized personnel away.
• Stay upwind, uphill and/or upstream.
• Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).

PROTECTIVE CLOTHING

• Wear positive pressure self-contained breathing apparatus (SCBA).
• Structural firefighters’ protective clothing provides thermal protection but provides only limited chemical protection.
• Always wear thermal protective clothing when handling refrigerated/cryogenic liquids.

EVACUATION

Immediate precautionary measure
  • Isolate spill or leak area for at least 100 metres (330 feet) in all directions.

Large Spill
  • Consider initial downwind evacuation for at least 800 metres (1/2 mile).

Fire
  • If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 metres (1 mile) in all directions; also, consider initial evacuation for 1600 metres (1 mile) in all directions.
  • In fires involving Liquefied Petroleum Gases (LPG) (UN1075); Butane, (UN1011); Butylene, (UN1012); Isobutylene, (UN1055); Propylene, (UN1077); Isobutane, (UN1969); and Propane, (UN1978), also refer to BLEVE – SAFETY PRECAUTIONS (Page 366)
EMERGENCY RESPONSE

FIRE

- DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.
- CAUTION: Hydrogen (UN1049), Deuterium (UN1957) and Hydrogen, refrigerated liquid (UN1966) burn with an invisible flame. Hydrogen and Methane mixture, compressed (UN2034) may burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.)

Small Fire
- Dry chemical or CO₂.

Large Fire
- Water spray or fog.
- Move containers from fire area if you can do it without risk.
- CAUTION: For LNG - Liquefied natural gas (UN1972) pool fires, DO NOT USE water. Use dry chemical or high-expansion foam.

Fire involving Tanks
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.
- CAUTION: For LNG - Liquefied natural gas (UN1972), DO NOT apply water, regular or alcohol-resistant foam directly on spill. Use high-expansion foam if available to reduce vapors.
- Prevent spreading of vapours through sewers, ventilation systems and confined areas.
- Isolate area until gas has dispersed.
- CAUTION: When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning.

FIRST AID

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Clothing frozen to the skin should be thawed before being removed.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim calm and warm.
POTENTIAL HAZARDS

FIRE OR EXPLOSION
- EXTREMELY FLAMMABLE.
- Will be easily ignited by heat, sparks or flames.
- Will form explosive mixtures with air. Acetylene (UN1001, UN3374) may react explosively even in the absence of air.
- Silane (UN2203) will ignite spontaneously in air.
- Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.
- Vapours from liquefied gas are initially heavier than air and spread along ground.
- Vapours may travel to source of ignition and flash back.
- Cylinders exposed to fire may vent and release flammable gas through pressure relief devices.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

HEALTH
- Vapours may cause dizziness or asphyxiation without warning.
- Some may be toxic if inhaled at high concentrations.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Fire may produce irritating and/or toxic gases.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 100 metres (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters’ protective clothing will provide thermal protection, but provides only limited chemical protection.

EVACUATION
Immediate precautionary measure
Large Spill
- Consider initial downwind evacuation for at least 800 metres (1/2 mile).
Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 metres (1 mile) in all directions; also, consider initial evacuation for 1600 metres (1 mile) in all directions.
EMERGENCY RESPONSE

FIRE
• DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.
  Small Fire
  • Dry chemical or CO₂.
  Large Fire
  • Water spray or fog.
  • Move containers from fire area if you can do it without risk.

Fire involving Tanks
• Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
• Cool containers with flooding quantities of water until well after fire is out.
• Do not direct water at source of leak or safety devices; icing may occur.
• Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
• ALWAYS stay away from tanks engulfed in fire.
• For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
• All equipment used when handling the product must be grounded.
• Stop leak if you can do it without risk.
• Do not touch or walk through spilled material.
• Do not direct water at spill or source of leak.
• Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
• If possible, turn leaking containers so that gas escapes rather than liquid.
• Prevent entry into waterways, sewers, basements or confined areas.
• Isolate area until gas has dispersed.

FIRST AID
• Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
• Move victim to fresh air.
• Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
• Give artificial respiration if victim is not breathing.
• Administer oxygen if breathing is difficult.
• Remove and isolate contaminated clothing and shoes.
• In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
• In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
• Keep victim calm and warm.
POTENTIAL HAZARDS

HEALTH
- TOXIC; Extremely Hazardous.
- May be fatal if inhaled or absorbed through skin.
- Initial odour may be irritating or foul and may deaden your sense of smell.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Fire will produce irritating, corrosive and/or toxic gases.
- Runoff from fire control may cause pollution.

FIRE OR EXPLOSION
- These materials are extremely flammable.
- May form explosive mixtures with air.
- May be ignited by heat, sparks or flames.
- Vapours from liquefied gas are initially heavier than air and spread along ground.
- Vapours may travel to source of ignition and flash back.
- Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.
- Runoff may create fire or explosion hazard.
- Cylinders exposed to fire may vent and release toxic and flammable gas through pressure relief devices.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 100 metres (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION
Immediate precautionary measure
Spill
- See Table 1 - Initial Isolation and Protective Action Distances.

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 metres (1 mile) in all directions; also, consider initial evacuation for 1600 metres (1 mile) in all directions.
EMERGENCY RESPONSE

FIRE
DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

Small Fire
- Dry chemical, CO₂, water spray or regular foam.

Large Fire
- Water spray, fog or regular foam.
- Move containers from fire area if you can do it without risk.
- Damaged cylinders should be handled only by specialists.

Fire involving Tanks
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Prevent entry into waterways, sewers, basements or confined areas.
- Isolate area until gas has dispersed.
- Consider igniting spill or leak to eliminate toxic gas concerns.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim calm and warm.
- Keep victim under observation.
- Effects of contact or inhalation may be delayed.
POTENTIAL HAZARDS

FIRE OR EXPLOSION
- EXTREMELY FLAMMABLE.
- May be ignited by heat, sparks or flames.
- May form explosive mixtures with air.
- Vapours from liquefied gas are initially heavier than air and spread along ground.
- Vapours may travel to source of ignition and flash back.
- Some of these materials may react violently with water.
- Cylinders exposed to fire may vent and release flammable gas through pressure relief devices.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

HEALTH
- May cause toxic effects if inhaled.
- Vapours are extremely irritating.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Fire will produce irritating, corrosive and/or toxic gases.
- Runoff from fire control may cause pollution.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 100 metres (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer where there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION
Immediate precautionary measure
Large Spill
- Consider initial downwind evacuation for at least 800 metres (1/2 mile).
Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 metres (1 mile) in all directions; also, consider initial evacuation for 1600 metres (1 mile) in all directions.
EMERGENCY RESPONSE

FIRE
- DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

Small Fire
- Dry chemical or CO₂.

Large Fire
- Water spray, fog or regular foam.
- Move containers from fire area if you can do it without risk.
- Damaged cylinders should be handled only by specialists.

Fire involving Tanks
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.
- Isolate area until gas has dispersed.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim calm and warm.
- Keep victim under observation.
- Effects of contact or inhalation may be delayed.
POTENTIAL HAZARDS

HEALTH
• TOXIC; may be fatal if inhaled or absorbed through skin.
• Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
• Fire will produce irritating, corrosive and/or toxic gases.
• Runoff from fire control may cause pollution.

FIRE OR EXPLOSION
• Flammable; may be ignited by heat, sparks or flames.
• May form explosive mixtures with air. Ethylene oxide (UN 1040) may react explosively even in the absence of air.
• Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.
• Vapours from liquefied gas are initially heavier than air and spread along ground.
• Vapours may travel to source of ignition and flash back.
• Some of these materials may react violently with water.
• Cylinders exposed to fire may vent and release toxic and flammable gas through pressure relief devices.
• Containers may explode when heated.
• Ruptured cylinders may rocket.
• Runoff may create fire or explosion hazard.

PUBLIC SAFETY
• CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
• As an immediate precautionary measure, isolate spill or leak area for at least 100 metres (330 feet) in all directions.
• Keep unauthorized personnel away.
• Stay upwind, uphill and/or upstream.
• Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
• Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
• Wear positive pressure self-contained breathing apparatus (SCBA).
• Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
• Structural firefighters’ protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION
Immediate precautionary measure
• Isolate spill or leak area for at least 100 metres (330 feet) in all directions.

Spill
• See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials. For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

Fire
• If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 metres (1 mile) in all directions; also, consider initial evacuation for 1600 metres (1 mile) in all directions.
EMERGENCY RESPONSE

FIRE
• DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.
Small Fire
• Dry chemical, CO₂, water spray or alcohol-resistant foam.
Large Fire
• Water spray, fog or alcohol-resistant foam.
• FOR CHLOROSILANES, DO NOT USE WATER; use AFFF alcohol-resistant medium-expansion foam.
• Move containers from fire area if you can do it without risk.
• Damaged cylinders should be handled only by specialists.

Fire involving Tanks
• Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
• Cool containers with flooding quantities of water until well after fire is out.
• Do not direct water at source of leak or safety devices; icing may occur.
• Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
• ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
• All equipment used when handling the product must be grounded.
• Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.
• Do not touch or walk through spilled material.
• Stop leak if you can do it without risk.
• Do not direct water at spill or source of leak.
• Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
• FOR CHLOROSILANES, use AFFF alcohol-resistant medium-expansion foam to reduce vapours.
• If possible, turn leaking containers so that gas escapes rather than liquid.
• Prevent entry into waterways, sewers, basements or confined areas.
• Isolate area until gas has dispersed.

FIRST AID
• Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
• Move victim to fresh air.
• Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
• Give artificial respiration if victim is not breathing.
• Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
• Administer oxygen if breathing is difficult.
• Remove and isolate contaminated clothing and shoes.
• In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
• In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
• In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
• Keep victim calm and warm.
• Keep victim under observation.
• Effects of contact or inhalation may be delayed.
GUIDE 120

Gases - Inert
(Including Refrigerated Liquids)

POTENTIAL HAZARDS

HEALTH

- Vapours may cause dizziness or asphyxiation without warning.
- Vapours from liquefied gas are initially heavier than air and spread along ground.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.

FIRE OR EXPLOSION

- Non-flammable gases.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

PUBLIC SAFETY

- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 100 metres (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters’ protective clothing will provide thermal protection but provides only limited chemical protection.
- Always wear thermal protective clothing when handling refrigerated/cryogenic liquids or solids.

EVACUATION

Immediate precautionary measure

Large Spill

- Consider initial downwind evacuation for at least 100 metres (330 feet).

Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

- Use extinguishing agent suitable for type of surrounding fire.
- Move containers from fire area if you can do it without risk.
- Damaged cylinders should be handled only by specialists.

Fire involving Tanks

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK

- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Prevent entry into waterways, sewers, basements or confined areas.
- Allow substance to evaporate.
- Ventilate the area.

CAUTION: When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning.

FIRST AID

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Clothing frozen to the skin should be thawed before being removed.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- Keep victim calm and warm.
There are no materials that refer to this guide.
## POTENTIAL HAZARDS

### FIRE OR EXPLOSION
- Substance does not burn but will support combustion.
- Some may react explosively with fuels.
- May ignite combustibles (wood, paper, oil, clothing, etc.).
- Vapours from liquefied gas are initially heavier than air and spread along ground.
- Runoff may create fire or explosion hazard.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

### HEALTH
- Vapours may cause dizziness or asphyxiation without warning.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Fire may produce irritating and/or toxic gases.

### PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 100 metres (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Ventilate closed spaces before entering.

### PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.
- Always wear thermal protective clothing when handling refrigerated/cryogenic liquids.

### EVACUATION

#### Immediate precautionary measure

**Large Spill**
- Consider initial downwind evacuation for at least 500 metres (1/3 mile).

**Fire**
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE
- Use extinguishing agent suitable for type of surrounding fire.
- **Small Fire**
  - Dry chemical or CO₂.
- **Large Fire**
  - Water spray, fog or regular foam.
  - Move containers from fire area if you can do it without risk.
  - Damaged cylinders should be handled only by specialists.
- **Fire involving Tanks**
  - Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
  - Cool containers with flooding quantities of water until well after fire is out.
  - Do not direct water at source of leak or safety devices; icing may occur.
  - Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
  - ALWAYS stay away from tanks engulfed in fire.
  - For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
- Keep combustibles (wood, paper, oil, etc.) away from spilled material.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Do not direct water at spill or source of leak.
- Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
- Prevent entry into waterways, sewers, basements or confined areas.
- Allow substance to evaporate.
- Isolate area until gas has dispersed.
- **CAUTION:** When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Clothing frozen to the skin should be thawed before being removed.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- Keep victim calm and warm.
POTENTIAL HAZARDS

HEALTH
- TOXIC; may be fatal if inhaled or absorbed through skin.
- Vapours may be irritating.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Fire will produce irritating, corrosive and/or toxic gases.
- Runoff from fire control may cause pollution.

FIRE OR EXPLOSION
- Some may burn but none ignite readily.
- Vapours from liquefied gas are initially heavier than air and spread along ground.
- Cylinders exposed to fire may vent and release toxic and/or corrosive gas through pressure relief devices.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 100 metres (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION
Immediate precautionary measure
Spill
- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials. For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

Small Fire
- Dry chemical or CO₂.

Large Fire
- Water spray, fog or regular foam.
- Do not get water inside containers.
- Move containers from fire area if you can do it without risk.
- Damaged cylinders should be handled only by specialists.

Fire involving Tanks
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
- Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Prevent entry into waterways, sewers, basements or confined areas.
- Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.
- Isolate area until gas has dispersed.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Keep victim calm and warm.
- Keep victim under observation.
- Effects of contact or inhalation may be delayed.
POTENTIAL HAZARDS

HEALTH
- TOXIC; may be fatal if inhaled or absorbed through skin.
- Fire will produce irritating, corrosive and/or toxic gases.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Runoff from fire control may cause pollution.

FIRE OR EXPLOSION
- Substance does not burn but will support combustion.
- Vapours from liquefied gas are initially heavier than air and spread along ground.
- These are strong oxidisers and will react vigorously or explosively with many materials including fuels.
- May ignite combustibles (wood, paper, oil, clothing, etc.).
- Some will react violently with air, moist air and/or water.
- Cylinders exposed to fire may vent and release toxic and/or corrosive gas through pressure relief devices.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service. As an immediate precautionary measure, isolate spill or leak area for at least 100 metres (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION
Immediate precautionary measure
Spill
- See Table 1 - Initial Isolation and Protective Action Distances.

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

Small Fire
CAUTION: These materials do not burn but will support combustion. Some will react violently with water.

- Contain fire and let burn. If fire must be fought, water spray or fog is recommended.
- Water only; no dry chemical, CO₂ or Halon®.
- Do not get water inside containers.
- Move containers from fire area if you can do it without risk.
- Damaged cylinders should be handled only by specialists.

Fire involving Tanks

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

- Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.
- Do not touch or walk through spilled material.
- Keep combustibles (wood, paper, oil, etc.) away from spilled material.
- Stop leak if you can do it without risk.
- Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Prevent entry into waterways, sewers, basements or confined areas.
- Isolate area until gas has dispersed.
- Ventilate the area.

FIRST AID

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Clothing frozen to the skin should be thawed before being removed.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Keep victim calm and warm.
- Keep victim under observation.
- Effects of contact or inhalation may be delayed.
POTENTIAL HAZARDS

HEALTH
- TOXIC; may be fatal if inhaled, ingested or absorbed through skin.
- Vapours are extremely irritating and corrosive.
- Contact with gas or liquified gas may cause burns, severe injury and/or frostbite.
- Fire will produce irritating, corrosive and/or toxic gases.
- Runoff from fire control may cause pollution.

FIRE OR EXPLOSION
- Some may burn but none ignite readily.
- Vapours from liquefied gas are initially heavier than air and spread along ground.
- Some of these materials may react violently with water.
- Cylinders exposed to fire may vent and release toxic and/or corrosive gas through pressure relief devices.
- Containers may explode when heated.
- Ruptured cylinders may rocket.
- For UN1005: Anhydrous ammonia, at high concentrations in confined spaces, presents a flammability risk if a source of ignition is introduced.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 100 metres (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION
Immediate precautionary measure
Spill
- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials. For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 metres (1 mile) in all directions; also, consider initial evacuation for 1600 metres (1 mile) in all directions.
EMERGENCY RESPONSE

FIRE

Small Fire
- Dry chemical or CO₂.

Large Fire
- Water spray, fog or regular foam.
- Move containers from fire area if you can do it without risk.
- Do not get water inside containers.
- Damaged cylinders should be handled only by specialists.

Fire involving Tanks
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
- Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Prevent entry into waterways, sewers, basements or confined areas.
- Do not direct water at spill or source of leak.
- Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
- Isolate area until gas has dispersed.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- In case of contact with Hydrogen fluoride, anhydrous (UN1052), flush with large amounts of water. For skin contact, if calcium gluconate gel is available, rinse 5 minutes, then apply gel. Otherwise, continue rinsing until medical treatment is available. For eyes, flush with water or a saline solution for 15 minutes.
- Keep victim calm and warm.
- Keep victim under observation.
- Effects of contact or inhalation may be delayed.
POTENTIAL HAZARDS

FIRE OR EXPLOSION

- Some may burn but none ignite readily.
- Containers may explode when heated.
- Ruptured cylinders may rocket.
- Caution: aerosols (UN1950) may contain a flammable propellant.

HEALTH

- Vapours may cause dizziness or asphyxiation without warning.
- Vapours from liquefied gas are initially heavier than air and spread along ground.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Fire may produce irritating, corrosive and/or toxic gases.

PUBLIC SAFETY

- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 100 metres (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters’ protective clothing will provide thermal protection but provides only limited chemical protection.

EVACUATION

Immediate precautionary measure

Large Spill

- Consider initial downwind evacuation for at least 500 metres (1/3 mile).

Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE
• Use extinguishing agent suitable for type of surrounding fire.
  
  **Small Fire**
• Dry chemical or CO₂.

  **Large Fire**
• Water spray, fog or regular foam.
• Move containers from fire area if you can do it without risk.
• Damaged cylinders should be handled only by specialists.

Fire involving Tanks
• Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
• Cool containers with flooding quantities of water until well after fire is out.
• Do not direct water at source of leak or safety devices; icing may occur.
• Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
• ALWAYS stay away from tanks engulfed in fire.
• Some of these materials, if spilled, may evaporate leaving a flammable residue.

SPILL OR LEAK
• Do not touch or walk through spilled material.
• Stop leak if you can do it without risk.
• Do not direct water at spill or source of leak.
• Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
• If possible, turn leaking containers so that gas escapes rather than liquid.
• Prevent entry into waterways, sewers, basements or confined areas.
• Allow substance to evaporate.
• Ventilate the area.

FIRST AID
• Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
• Move victim to fresh air.
• Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
• Give artificial respiration if victim is not breathing.
• Administer oxygen if breathing is difficult.
• Remove and isolate contaminated clothing and shoes.
• In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
• Keep victim calm and warm.
## POTENTIAL HAZARDS

### FIRE OR EXPLOSION
- HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
- Vapours may form explosive mixtures with air.
- Vapours may travel to source of ignition and flash back.
- Most vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Vapour explosion hazard indoors, outdoors or in sewers.
- Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.
- Runoff to sewer may create fire or explosion hazard.
- Containers may explode when heated.
- Many liquids are lighter than water.

### HEALTH
- Inhalation or contact with material may irritate or burn skin and eyes.
- Fire may produce irritating, corrosive and/or toxic gases.
- Vapours may cause dizziness or suffocation.
- Runoff from fire control may cause pollution.

### PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 50 metres (150 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate closed spaces before entering.

### PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters’ protective clothing will only provide thermal protection but provides only limited chemical protection.

### EVACUATION
**Immediate precautionary measure**

**Large Spill**
- Consider initial downwind evacuation for at least 300 metres (1000 feet).

**Fire**
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.
CAUTION: For fire involving UN1170, UN1987 or UN3475, alcohol-resistant foam should be used.
CAUTION: Ethanol (UN1170) can burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.)

Small Fire
- Dry chemical, CO₂, water spray or alcohol-resistant foam.

Large Fire
- Water spray, fog or alcohol-resistant foam.
- Do not use straight streams.
- Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.
- A vapour-suppressing foam may be used to reduce vapours.
- Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- Use clean, non-sparking tools to collect absorbed material.

Large Spill
- Dike far ahead of liquid spill for later disposal.
- Water spray may reduce vapour, but may not prevent ignition in closed spaces.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Wash skin with soap and water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim calm and warm.
POTENTIAL HAZARDS

FIRE OR EXPLOSION

- HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
- Vapours may form explosive mixtures with air.
- Vapours may travel to source of ignition and flash back.
- Most vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Vapour explosion hazard indoors, outdoors or in sewers.
- Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.
- Runoff to sewer may create fire or explosion hazard.
- Containers may explode when heated.
- Many liquids are lighter than water.
- Substance may be transported hot.
- For hybrid vehicles, GUIDE 147 (lithium ion batteries) or GUIDE 138 (sodium batteries) should also be consulted.
- If molten aluminum is involved, refer to GUIDE 169.

HEALTH

- CAUTION: Petroleum crude oil (UN1267) may contain TOXIC hydrogen sulphide gas.
- Inhalation or contact with material may irritate or burn skin and eyes.
- Fire may produce irritating, corrosive and/or toxic gases.
- Vapours may cause dizziness or suffocation.
- Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY

- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 50 metres (150 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

EVACUATION

Immediate precautionary measure

Large Spill
- Consider initial downwind evacuation for at least 300 metres (1000 feet).

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

CAUTION: For mixtures containing alcohol or polar solvent, alcohol-resistant foam may be more effective.

Small Fire
- Dry chemical, CO₂, water spray or regular foam.

Large Fire
- Water spray, fog or regular foam.
- Do not use straight streams.
- Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.
- A vapour-suppressing foam may be used to reduce vapours.
- Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- Use clean, non-sparking tools to collect absorbed material.

Large Spill
- Dike far ahead of liquid spill for later disposal.
- Water spray may reduce vapour, but may not prevent ignition in closed spaces.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Wash skin with soap and water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim calm and warm.
**POTENTIAL HAZARDS**

**FIRE OR EXPLOSION**
- **HIGHLY FLAMMABLE:** Will be easily ignited by heat, sparks or flames.
- Vapours may form explosive mixtures with air.
- Vapours may travel to source of ignition and flash back.
- Most vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Vapour explosion hazard indoors, outdoors or in sewers.
- Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.
- Runoff to sewer may create fire or explosion hazard.
- Containers may explode when heated.
- Many liquids are lighter than water.

**HEALTH**
- May cause toxic effects if inhaled or absorbed through skin.
- Inhalation or contact with material may irritate or burn skin and eyes.
- Fire will produce irritating, corrosive and/or toxic gases.
- Vapours may cause dizziness or suffocation.
- Runoff from fire control or dilution water may cause pollution.

**PUBLIC SAFETY**
- **CALL EMERGENCY RESPONSE** Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 50 metres (150 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate closed spaces before entering.

**PROTECTIVE CLOTHING**
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

**EVACUATION**

**Large Spill**
- Consider initial downwind evacuation for at least 300 metres (1000 feet).

**Fire**
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Small Fire
- Dry chemical, CO₂, water spray or alcohol-resistant foam.
- Do not use dry chemical extinguishers to control fires involving nitromethane (UN1261) or nitroethane (UN2842).

Large Fire
- Water spray, fog or alcohol-resistant foam.
- Do not use straight streams.
- Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.
- A vapour-suppressing foam may be used to reduce vapours.
- Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- Use clean, non-sparking tools to collect absorbed material.

Large Spill
- Dike far ahead of liquid spill for later disposal.
- Water spray may reduce vapour, but may not prevent ignition in closed spaces.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Wash skin with soap and water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim calm and warm.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
POTENTIAL HAZARDS

FIRE OR EXPLOSION
- HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
- Vapours may form explosive mixtures with air.
- Vapours may travel to source of ignition and flash back.
- Most vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Vapour explosion hazard indoors, outdoors or in sewers.
- Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.
- Runoff to sewer may create fire or explosion hazard.
- Containers may explode when heated.
- Many liquids are lighter than water.

HEALTH
- May cause toxic effects if inhaled or absorbed through skin.
- Inhalation or contact with material may irritate or burn skin and eyes.
- Fire will produce irritating, corrosive and/or toxic gases.
- Vapours may cause dizziness or suffocation.
- Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service. As an immediate precautionary measure, isolate spill or leak area for at least 50 metres (150 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

EVACUATION
Large Spill
- Consider initial downwind evacuation for at least 300 metres (1000 feet).

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Small Fire
- Dry chemical, CO\textsubscript{2}, water spray or regular foam.

Large Fire
- Water spray, fog or regular foam.
- Do not use straight streams.
- Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.
- A vapour-suppressing foam may be used to reduce vapours.
- Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- Use clean, non-sparking tools to collect absorbed material.

Large Spill
- Dike far ahead of liquid spill for later disposal.
- Water spray may reduce vapour, but may not prevent ignition in closed spaces.

FIRST AID

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Wash skin with soap and water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim calm and warm.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
POTENTIAL HAZARDS

HEALTH
- TOXIC; may be fatal if inhaled, ingested or absorbed through skin.
- Inhalation or contact with some of these materials will irritate or burn skin and eyes.
- Fire will produce irritating, corrosive and/or toxic gases.
- Vapours may cause dizziness or suffocation.
- Runoff from fire control or dilution water may cause pollution.

FIRE OR EXPLOSION
- HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
- Vapours may form explosive mixtures with air.
- Vapours may travel to source of ignition and flash back.
- Most vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Vapour explosion and poison hazard indoors, outdoors or in sewers.
- Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.
- Runoff to sewer may create fire or explosion hazard.
- Containers may explode when heated.
- Many liquids are lighter than water.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 50 metres (150 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION
Immediate precautionary measure
Spill
- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials.
  For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.
Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
# EMERGENCY RESPONSE

## FIRE

**CAUTION:** All these products have a very low flash point. Use of water spray when fighting fire may be inefficient.

**CAUTION:** Methanol (UN1230) will burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.)

### Small Fire
- Dry chemical, CO₂, water spray or alcohol-resistant foam.

### Large Fire
- Water spray, fog or alcohol-resistant foam.
- Move containers from fire area if you can do it without risk.
- Dike fire-control water for later disposal; do not scatter the material.
- Use water spray or fog; do not use straight streams.

### Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- **ALWAYS** stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

## SPILL OR LEAK

- Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.
- **ELIMINATE** all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.
- A vapour-suppressing foam may be used to reduce vapours.

### Small Spill
- Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal.
- Use clean, non-sparking tools to collect absorbed material.

### Large Spill
- Dike far ahead of liquid spill for later disposal.
- Water spray may reduce vapour, but may not prevent ignition in closed spaces.

## FIRST AID

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Wash skin with soap and water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim calm and warm.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
POTENTIAL HAZARDS

FIRE OR EXPLOSION
- Flammable/combustible material.
- May be ignited by heat, sparks or flames.
- Vapours may form explosive mixtures with air.
- Vapours may travel to source of ignition and flash back.
- Most vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Vapour explosion hazard indoors, outdoors or in sewers.
- Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.
- Runoff to sewer may create fire or explosion hazard.
- Containers may explode when heated.
- Many liquids are lighter than water.

HEALTH
- May cause toxic effects if inhaled or ingested/swallowed.
- Contact with substance may cause severe burns to skin and eyes.
- Fire will produce irritating, corrosive and/or toxic gases.
- Vapours may cause dizziness or suffocation.
- Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 50 metres (150 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters’ protective clothing provides limited protection in fire situations ONLY it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION
Immediate precautionary measure
Spill
- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials. For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

- Some of these materials may react violently with water.

Small Fire
- Dry chemical, CO₂, water spray or alcohol-resistant foam.

Large Fire
- Water spray, fog or alcohol-resistant foam.
- Move containers from fire area if you can do it without risk.
- Dike fire-control water for later disposal; do not scatter the material.
- Do not get water inside containers.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

- Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.
- A vapour-suppressing foam may be used to reduce vapours.
- Absorb with earth, sand or other non-combustible material and transfer to containers (except for Hydrazine).
- Use clean, non-sparking tools to collect absorbed material.

Large Spill
- Dike far ahead of liquid spill for later disposal.
- Water spray may reduce vapour, but may not prevent ignition in closed spaces.

FIRST AID

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim calm and warm.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
POTENTIAL HAZARDS

FIRE OR EXPLOSION
- Flammable/combustible material.
- May be ignited by friction, heat, sparks or flames.
- Some may burn rapidly with flare-burning effect.
- Powders, dusts, shavings, borings, turnings or cuttings may explode or burn with explosive violence.
- Substance may be transported in a molten form at a temperature that may be above its flash point.
- May re-ignite after fire is extinguished.

HEALTH
- Fire may produce irritating and/or toxic gases.
- Contact may cause burns to skin and eyes.
- Contact with molten substance may cause severe burns to skin and eyes.
- Runoff from fire control may cause pollution.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 25 metres (75 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

EVACUATION
Immediate precautionary measure
Large Spill
- Consider initial downwind evacuation for at least 100 metres (330 feet).

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE
Small Fire
• Dry chemical, CO$_2$, sand, earth, water spray or regular foam.
Large Fire
• Water spray, fog or regular foam.
• Move containers from fire area if you can do it without risk.

Fire Involving Metal Pigments or Pastes (e.g. “Aluminum Paste”)
• Aluminum Paste fires should be treated as a combustible metal fire. Use DRY sand, graphite powder, dry sodium chloride-based extinguishers, G-1$^\text{®}$ or Met-L-X$^\text{®}$ powder. Also, see GUIDE 170.

Fire involving Tanks or Car/Trailer Loads
• Cool containers with flooding quantities of water until well after fire is out.
• For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.
• Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
• ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
• Do not touch or walk through spilled material.

Small Dry Spill
• With clean shovel, place material into clean, dry container and cover loosely; move containers from spill area.

Large Spill
• Wet down with water and dike for later disposal.
• Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID
• Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
• Move victim to fresh air.
• Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
• Give artificial respiration if victim is not breathing.
• Administer oxygen if breathing is difficult.
• Remove and isolate contaminated clothing and shoes.
• In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
• Removal of solidified molten material from skin requires medical assistance.
• Keep victim calm and warm.
POTENTIAL HAZARDS

FIRE OR EXPLOSION
- Flammable/combustible material.
- May be ignited by heat, sparks or flames.
- When heated, vapours may form explosive mixtures with air: indoors, outdoors and sewers explosion hazards.
- Contact with metals may evolve flammable hydrogen gas.
- Containers may explode when heated.

HEALTH
- TOXIC; inhalation, ingestion or skin contact with material may cause severe injury or death.
- Fire will produce irritating, corrosive and/or toxic gases.
- Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 25 metres (75 feet) in all directions.
- Stay upwind, uphill and/or upstream.
- Keep unauthorized personnel away.
- Ventilate enclosed areas.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION

Immediate precautionary measure

Large Spill
- Consider initial downwind evacuation for at least 100 metres (330 feet).

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

Small Fire
- Dry chemical, CO$_2$, water spray or alcohol-resistant foam.

Large Fire
- Water spray, fog or alcohol-resistant foam.
- Move containers from fire area if you can do it without risk.
- Use water spray or fog; do not use straight streams.
- Do not get water inside containers.
- Dike fire-control water for later disposal; do not scatter the material.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
- Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- Stop leak if you can do it without risk.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Prevent entry into waterways, sewers, basements or confined areas.
- Use clean, non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- For minor skin contact, avoid spreading material on unaffected skin.
- Keep victim calm and warm.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
POTENTIAL HAZARDS

FIRE OR EXPLOSION
- Flammable/combustible material.
- May ignite on contact with moist air or moisture.
- May burn rapidly with flare-burning effect.
- Some react vigorously or explosively on contact with water.
- Some may decompose explosively when heated or involved in a fire.
- May re-ignite after fire is extinguished.
- Runoff may create fire or explosion hazard.
- Containers may explode when heated.

HEALTH
- Fire will produce irritating, corrosive and/or toxic gases.
- Inhalation of decomposition products may cause severe injury or death.
- Contact with substance may cause severe burns to skin and eyes.
- Runoff from fire control may cause pollution.
- **CAUTION:** Pentaborane (UN1380) is highly toxic and may be fatal if inhaled, ingested or absorbed through skin.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Stay upwind, uphill and/or upstream.
- Keep unauthorized personnel away.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection.
- Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

EVACUATION
Immediate precautionary measure
Spill
- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials.
  For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

• DO NOT USE WATER, CO₂ OR FOAM ON MATERIAL ITSELF.
• Some of these materials may react violently with water.

CAUTION: For Xanthates, UN3342 and for Dithionite (Hydrosulfite/Hydrosulphite) UN1384, UN1923 and UN1929, USE FLOODING AMOUNTS OF WATER for SMALL AND LARGE fires to stop the reaction. Smothering will not work for these materials, they do not need air to burn.

Small Fire
• Dry chemical, soda ash, lime or DRY sand, EXCEPT for UN1384, UN1923, UN1929 and UN3342.

Large Fire
• DRY sand, dry chemical, soda ash or lime EXCEPT for UN1384, UN1923, UN1929 and UN3342, or withdraw from area and let fire burn.
• CAUTION: UN3342 when flooded with water will continue to evolve flammable Carbon disulfide/Carbon disulphide vapours.
• Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
• Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
• Do not get water inside containers or in contact with substance.
• Cool containers with flooding quantities of water until well after fire is out.
• withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
• ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK

• Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.
• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
• Do not touch or walk through spilled material.
• Stop leak if you can do it without risk.

Small Spill
CAUTION: For spills of Xanthates, UN3342 and for Dithionite (Hydrosulfite/Hydrosulphite), UN1384, UN1923 and UN1929, dissolve in 5 parts water and collect for proper disposal.
• CAUTION: UN3342 when flooded with water will continue to evolve flammable Carbon disulfide/Carbon disulphide vapours.
• Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.
• Use clean, non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal.
• Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID

• Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
• Move victim to fresh air.
• Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
• Give artificial respiration if victim is not breathing.
• Administer oxygen if breathing is difficult.
• Remove and isolate contaminated clothing and shoes.
• In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
• Keep victim calm and warm.
**POTENTIAL HAZARDS**

**FIRE OR EXPLOSION**
- Extremely flammable; will ignite itself if exposed to air.
- Burns rapidly, releasing dense, white, irritating fumes.
- Substance may be transported in a molten form.
- May re-ignite after fire is extinguished.
- Corrosive substances in contact with metals may produce flammable hydrogen gas.
- Containers may explode when heated.

**HEALTH**
- Fire will produce irritating, corrosive and/or toxic gases.
- TOXIC; ingestion of substance or inhalation of decomposition products will cause severe injury or death.
- Contact with substance may cause severe burns to skin and eyes.
- Some effects may be experienced due to skin absorption.
- Runoff from fire control may be corrosive and/or toxic and cause pollution.

**PUBLIC SAFETY**
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Stay upwind, uphill and/or upstream.
- Keep unauthorized personnel away.

**PROTECTIVE CLOTHING**
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters’ protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.
- For Phosphorus (UN1381): Special aluminized protective clothing should be worn when direct contact with the substance is possible.

**EVACUATION**

**Immediate precautionary measure**

**Spill**
- Consider initial downwind evacuation for at least 300 metres (1000 feet).

**Fire**
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

Small Fire
- Water spray, wet sand or wet earth.

Large Fire
- Water spray or fog.
- Do not scatter spilled material with high-pressure water streams.
- Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK

- Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- Do not touch or walk through spilled material.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Stop leak if you can do it without risk.

Small Spill
- Cover with water, sand or earth. Shovel into metal container and keep material under water.

Large Spill
- Dike for later disposal and cover with wet sand or earth.
- Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- In case of contact with substance, keep exposed skin areas immersed in water or covered with wet bandages until medical attention is received.
- Removal of solidified molten material from skin requires medical assistance.
- Remove and isolate contaminated clothing and shoes at the site and place in metal container filled with water. Fire hazard if allowed to dry.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
- Keep victim calm and warm.
POTENTIAL HAZARDS

HEALTH

• CORROSIVE and/or TOXIC; inhalation, ingestion or contact (skin, eyes) with vapours, dusts or substance may cause severe injury, burns or death.
• Fire will produce irritating, corrosive and/or toxic gases.
• Reaction with water may generate much heat that will increase the concentration of fumes in the air.
• Contact with molten substance may cause severe burns to skin and eyes.
• Runoff from fire control or dilution water may cause pollution.

FIRE OR EXPLOSION

• EXCEPT FOR ACETIC ANHYDRIDE (UN1715), THAT IS FLAMMABLE, some of these materials may burn, but none ignite readily.
• May ignite combustibles (wood, paper, oil, clothing, etc.).
• Substance will react with water (some violently), releasing corrosive and/or toxic gases and runoff.
• Flammable/toxic gases may accumulate in confined areas (basement, tanks, hopper/tank cars, etc.).
• Contact with metals may evolve flammable hydrogen gas.
• Containers may explode when heated or if contaminated with water.
• Substance may be transported in a molten form.

PUBLIC SAFETY

• CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
• As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
• Keep unauthorized personnel away.
• Stay upwind, uphill and/or upstream.
• Ventilate enclosed areas.

PROTECTIVE CLOTHING

• Wear positive pressure self-contained breathing apparatus (SCBA).
• Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection.
• Structural firefighters’ protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION

Immediate precautionary measure

Spill
• See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials.
  For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

Fire
• If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

• When material is not involved in fire, do not use water on material itself.

Small Fire

• Dry chemical or CO₂.
• Move containers from fire area if you can do it without risk.

Large Fire

• Flood fire area with large quantities of water, while knocking down vapours with water fog. If insufficient water supply: knock down vapours only.

Fire involving Tanks or Car/Trailer Loads

• Cool containers with flooding quantities of water until well after fire is out.
• Do not get water inside containers.
• Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
• ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK

• Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.
• Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
• Stop leak if you can do it without risk.
• Use water spray to reduce vapours; do not put water directly on leak, spill area or inside container.
• Keep combustibles (wood, paper, oil, etc.) away from spilled material.

Small Spill

• Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.
• Use clean, non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal.
• Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID

• Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
• Move victim to fresh air.
• Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
• Give artificial respiration if victim is not breathing.
• Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
• Administer oxygen if breathing is difficult.
• Remove and isolate contaminated clothing and shoes.
• In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
• For minor skin contact, avoid spreading material on unaffected skin.
• Removal of solidified molten material from skin requires medical assistance.
• Keep victim calm and warm.
• Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
**GUIDE 138**

**Substances - Water-Reactive (Emitting Flammable Gases)**

**POTENTIAL HAZARDS**

**FIRE OR EXPLOSION**

- Produce flammable gases on contact with water.
- May ignite on contact with water or moist air.
- Some may react vigorously or explosively on contact with water.
- May be ignited by heat, sparks or flames.
- May re-ignite after fire is extinguished.
- Some may be transported in highly flammable liquids.
- Runoff may create fire or explosion hazard.

**HEALTH**

- Inhalation or contact with vapours, substance or decomposition products may cause severe injury or death.
- May produce corrosive solutions on contact with water.
- Fire will produce irritating, corrosive and/or toxic gases.
- Runoff from fire control may cause pollution.

**PUBLIC SAFETY**

- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate the area before entry.

**PROTECTIVE CLOTHING**

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

**EVACUATION**

**Immediate precautionary measure**

**Spill**

- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials.
- For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

**Fire**

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

- DO NOT USE WATER OR FOAM.

Small Fire
- Dry chemical, soda ash, lime or sand.

Large Fire
- DRY sand, dry chemical, soda ash or lime or withdraw from area and let fire burn.
- Move containers from fire area if you can do it without risk.

Fire Involving Metals or Powders (Aluminum, Lithium, Magnesium, etc.)
- Use dry chemical, DRY sand, sodium chloride powder, graphite powder or Met-L-X® powder; in addition, for Lithium you may use Lith-X® powder or copper powder.
- Also, see GUIDE 170.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Do not get water inside containers.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
- DO NOT GET WATER on spilled substance or inside containers.

Small Spill
- Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.
- Dike for later disposal; do not apply water unless directed to do so.

Powder Spill
- Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.
- DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.

FIRST AID

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, wipe from skin immediately; flush skin or eyes with running water for at least 20 minutes.
- Keep victim calm and warm.
POTENTIAL HAZARDS

FIRE OR EXPLOSION
- Produce flammable and toxic gases on contact with water.
- May ignite on contact with water or moist air.
- Some react vigorously or explosively on contact with water.
- May be ignited by heat, sparks or flames.
- May re-ignite after fire is extinguished.
- Some are transported in highly flammable liquids.
- Containers may explode when heated.
- Runoff may create fire or explosion hazard.

HEALTH
- Highly toxic: contact with water produces toxic gas, may be fatal if inhaled.
- Inhalation or contact with vapours, substance or decomposition products may cause severe injury or death.
- May produce corrosive solutions on contact with water.
- Fire will produce irritating, corrosive and/or toxic gases.
- Runoff from fire control may cause pollution.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate the area before entry.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters’ protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION

Immediate precautionary measure
Spill
- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials.
  For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE
- DO NOT USE WATER OR FOAM. (FOAM MAY BE USED FOR CHLOROSILANES, SEE BELOW)
  Small Fire
  - Dry chemical, soda ash, lime or sand.
  Large Fire
  - DRY sand, dry chemical, soda ash or lime or withdraw from area and let fire burn.
  - FOR CHLOROSILANES, DO NOT USE WATER; use AFFF alcohol-resistant medium-expansion foam;
    DO NOT USE dry chemicals, soda ash or lime on chlorosilane fires (large or small) as they may release
    large quantities of hydrogen gas that may explode.
  - Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not get water inside containers.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
- Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- DO NOT GET WATER on spilled substance or inside containers.
- Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact
  spilled material.
- FOR CHLOROSILANES, use AFFF alcohol-resistant medium-expansion foam to reduce vapours.
  Small Spill
  - Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to
    minimize spreading or contact with rain.
  - Dike for later disposal; do not apply water unless directed to do so.
  Powder Spill
  - Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.
  - DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to
  protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration
  with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, wipe from skin immediately; flush skin or eyes with running water
  for at least 20 minutes.
- Keep victim calm and warm.
**POTENTIAL HAZARDS**

**FIRE OR EXPLOSION**

CAUTION: Ammonium Nitrate may explode if involved in fire or contaminated with hydrocarbons (fuels), organic matter, other contaminants or when hot molten and contained; Treat as an explosive (GUIDE 112).

- These substances will accelerate burning when involved in a fire.
- Some may decompose explosively when heated or involved in a fire.
- May explode from heat or contamination.
- Some will react explosively with hydrocarbons (fuels).
- May ignite combustibles (wood, paper, oil, clothing, etc.).
- Containers may explode when heated.
- Runoff may create fire or explosion hazard.

**HEALTH**

- Inhalation, ingestion or contact (skin, eyes) with vapours or substance may cause severe injury, burns or death.
- Fire may produce irritating, corrosive and/or toxic gases.
- Runoff from fire control or dilution water may cause pollution.

**PUBLIC SAFETY**

- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate closed spaces before entering.

**PROTECTIVE CLOTHING**

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

**EVACUATION**

Immediate precautionary measure

Large Spill

- Consider initial downwind evacuation for at least 100 metres (330 feet).

Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
- If ammonium nitrate is in a tank, rail car or tank truck and involved in a fire, ISOLATE for 1600 metres (1 mile) in all directions also, initiate evacuation including emergency responders for 1600 metres (1 mile) in all directions.


**FIRE**

**Small Fire**
- Consider initial evacuation in all directions for at least 500 metres (1/3 mile).
- Use water. Do not use carbon dioxide, dry chemicals or foam.
- If not sure about size of fire, treat as large fire.
- If safe to do so from a protected position or use unmanned monitors apply FLOODING quantities of water.
- Allow fire to burn out and containers to cool.

**Large Fire or Fire involving transport containers**
- Do not fight cargo fire involving Ammonium Nitrate - Withdraw, evacuate and isolate area for at least 1600 metres (1 mile). Treat as an explosive (GUIDE 112)
- If unable to control truck fire, or fire cannot be prevented from involving Ammonium Nitrate, treat as cargo fire involving Ammonium Nitrate.
- Do not enter area for 24 hours or until expert advice has been provided.
- Do not move cargo or vehicle if cargo has been exposed to heat.

**Fire involving Tanks or Car/Trailer Loads**
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

**SPILL OR LEAK**
- Keep combustibles (wood, paper, oil, etc.) away from spilled material.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Stop leak if you can do it without risk.
- Do not get water inside containers.

**Small Dry Spill**
- With clean shovel, place material into clean, dry container and cover loosely; move containers from spill area.

**Small Liquid Spill**
- Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal.

**Large Spill**
- Dike far ahead of liquid spill for later disposal.
- Following product recovery, flush area with water.

**FIRST AID**
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Contaminated clothing may be a fire risk when dry.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Keep victim calm and warm.
POTENTIAL HAZARDS

FIRE OR EXPLOSION

- These substances will accelerate burning when involved in a fire.
- May explode from heat or contamination.
- Some may burn rapidly.
- Some will react explosively with hydrocarbons (fuels).
- May ignite combustibles (wood, paper, oil, clothing, etc.).
- Containers may explode when heated.
- Runoff may create fire or explosion hazard.

HEALTH

- Toxic by ingestion.
- Inhalation of dust is toxic.
- Fire may produce irritating, corrosive and/or toxic gases.
- Contact with substance may cause severe burns to skin and eyes.
- Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY

- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

EVACUATION

Immediate precautionary measure

Large Spill
- Consider initial downwind evacuation for at least 100 metres (330 feet).

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

Small Fire
- Use water. Do not use dry chemicals or foams. CO₂ or Halon® may provide limited control.

Large Fire
- Flood fire area with water from a distance.
- Do not move cargo or vehicle if cargo has been exposed to heat.
- Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
- Keep combustibles (wood, paper, oil, etc.) away from spilled material.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Stop leak if you can do it without risk.

Small Dry Spill
- With clean shovel, place material into clean, dry container and cover loosely; move containers from spill area.

Large Spill
- Dike far ahead of spill for later disposal.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Contaminated clothing may be a fire risk when dry.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Keep victim calm and warm.
**GUIDE Oxidisers - Toxic (Liquid)**

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**POTENTIAL HAZARDS**

**FIRE OR EXPLOSION**
- These substances will accelerate burning when involved in a fire.
- May explode from heat or contamination.
- Some will react explosively with hydrocarbons (fuels).
- May ignite combustibles (wood, paper, oil, clothing, etc.).
- Containers may explode when heated.
- Runoff may create fire or explosion hazard.

**HEALTH**
- TOXIC; inhalation, ingestion or contact (skin, eyes) with vapours or substance may cause severe injury, burns or death.
- Fire may produce irritating, corrosive and/or toxic gases.
- Toxic/flamable fumes may accumulate in confined areas (basement, tanks, tank cars, etc.).
- Runoff from fire control or dilution water may cause pollution.

**PUBLIC SAFETY**
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 50 metres (150 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate closed spaces before entering.

**PROTECTIVE CLOTHING**
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

**EVACUATION**

**Immediate precautionary measure**

**Spill**
- See [Table 1 - Initial Isolation and Protective Action Distances](#) for highlighted materials.
- For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

**Fire**
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

Small Fire
- Use water. Do not use dry chemicals or foams. CO₂ or Halon® may provide limited control.

Large Fire
- Flood fire area with water from a distance.
- Do not move cargo or vehicle if cargo has been exposed to heat.
- Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

- Keep combustibles (wood, paper, oil, etc.) away from spilled material.
- Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Stop leak if you can do it without risk.
- Use water spray to reduce vapours or divert vapour cloud drift.
- Do not get water inside containers.

Small Liquid Spill
- Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal.

Large Spill
- Dike far ahead of liquid spill for later disposal.

FIRST AID

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Contaminated clothing may be a fire risk when dry.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Keep victim calm and warm.
POTENTIAL HAZARDS

FIRE OR EXPLOSION
- Caution oxidizers (such as chlorites, chlorates and perchlorates) may explode if involved in fire or contaminated with hydrocarbons, (fuels), organic matter, other contaminants or when hot, molten and contained. Treat as an explosive (Guide 112).
- May explode from friction, heat or contamination.
- These substances will accelerate burning when involved in a fire.
- May ignite combustibles (wood, paper, oil, clothing, etc.).
- Containers may explode when heated.
- Runoff may create fire or explosion hazard.

HEALTH
- TOXIC; inhalation, ingestion or contact (skin, eyes) with vapours, dusts or substance may cause severe injury, burns or death.
- Fire may produce irritating and/or toxic gases.
- Toxic fumes or dust may accumulate in confined areas (basement, tanks, hopper/tank cars, etc.).
- Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters’ protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION

Spill
- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials. For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

Small Fire
- Consider initial evacuation in all directions for at least 500 metres (1/3 mile).
- Use water. Do not use carbon dioxide, dry chemicals or foam.
- If not sure about size of fire, treat as large fire.
- If safe to do so from a protected position or use unmanned monitors apply FLOODING quantities of water.
- Allow fire to burn out and containers to cool.

Large Fire
- Do not fight cargo fire involving the product - Withdraw, evacuate and isolate area for at least 1600 metres (1 mile). Treat as an explosive (GUIDE 112).
- If unable to control truck fire, or fire cannot be prevented from involving the product, treat as cargo fire involving the product.
- Do not enter area for 24 hours or until expert advice has been provided.
- Do not get water inside containers: a violent reaction may occur.

SPILL OR LEAK
- Keep combustibles (wood, paper, oil, etc.) away from spilled material.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Use water spray to reduce vapours or divert vapour cloud drift.
- Prevent entry into waterways, sewers, basements or confined areas.

Small Spill
- Flush area with flooding quantities of water.

Large Spill
- DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Contaminated clothing may be a fire risk when dry.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Keep victim calm and warm.
POTENTIAL HAZARDS

FIRE OR EXPLOSION

• May ignite combustibles (wood, paper, oil, clothing, etc.).
• React vigorously and/or explosively with water.
• Produce toxic and/or corrosive substances on contact with water.
• Flammable/toxic gases may accumulate in tanks and hopper cars.
• Some may produce flammable hydrogen gas upon contact with metals.
• Containers may explode when heated.
• Runoff may create fire or explosion hazard.

HEALTH

• TOXIC; inhalation or contact with vapour, substance, or decomposition products may cause severe injury or death.
• Fire will produce irritating, corrosive and/or toxic gases.
• Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY

• CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
• As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
• Keep unauthorized personnel away.
• Stay upwind, uphill and/or upstream.
• Ventilate closed spaces before entering.

PROTECTIVE CLOTHING

• Wear positive pressure self-contained breathing apparatus (SCBA).
• Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
• Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION

Immediate precautionary measure

Spill

• See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials.
  For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

Fire

• If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE
• DO NOT USE WATER OR FOAM.

Small Fire
• Dry chemical, soda ash or lime.

Large Fire
• DRY sand, dry chemical, soda ash or lime or withdraw from area and let fire burn.
• Do not move cargo or vehicle if cargo has been exposed to heat.
• Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
• Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
• Cool containers with flooding quantities of water until well after fire is out.
• Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
• ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
• Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
• Stop leak if you can do it without risk.
• Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
• DO NOT GET WATER on spilled substance or inside containers.

Small Spill
• Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.

Large Spill
• DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.

FIRST AID
• Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
• Move victim to fresh air.
• Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
• Give artificial respiration if victim is not breathing.
• Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
• Administer oxygen if breathing is difficult.
• Remove and isolate contaminated clothing and shoes.
• Contaminated clothing may be a fire risk when dry.
• In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
• Keep victim calm and warm.
• Keep victim under observation.
• Effects of contact or inhalation may be delayed.
# Organic Peroxides (Heat and Contamination Sensitive)

## Potential Hazards

### Fire or Explosion
- May explode from heat or contamination.
- May ignite combustibles (wood, paper, oil, clothing, etc.).
- May be ignited by heat, sparks or flames.
- May burn rapidly with flare-burning effect.
- Containers may explode when heated.
- Runoff may create fire or explosion hazard.

### Health
- Fire may produce irritating, corrosive and/or toxic gases.
- Ingestion or contact (skin, eyes) with substance may cause severe injury or burns.
- Runoff from fire control or dilution water may cause pollution.

### Public Safety
- **CALL EMERGENCY RESPONSE** Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.

### Protective Clothing
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

### Evacuation

#### Immediate precautionary measure

#### Large Spill
- Consider initial evacuation for at least 250 metres (800 feet) in all directions.

#### Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

Small Fire
- Water spray or fog is preferred; if water not available use dry chemical, CO\textsubscript{2} or regular foam.

Large Fire
- Flood fire area with water from a distance.
- Use water spray or fog; do not use straight streams.
- Do not move cargo or vehicle if cargo has been exposed to heat.
- Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- Keep combustibles (wood, paper, oil, etc.) away from spilled material.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Keep substance wet using water spray.
- Stop leak if you can do it without risk.

Small Spill
- Pick up with inert, damp, non-combustible material using clean, non-sparking tools and place into loosely covered plastic containers for later disposal.

Large Spill
- Wet down with water and dike for later disposal.
- Prevent entry into waterways, sewers, basements or confined areas.
- DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.

FIRST AID

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Contaminated clothing may be a fire risk when dry.
- Remove material from skin immediately.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Keep victim calm and warm.
ORGANIC PEROXIDES
(Heat, Contamination and Friction Sensitive)

POTENTIAL HAZARDS

FIRE OR EXPLOSION
• May explode from heat, shock, friction or contamination.
• May ignite combustibles (wood, paper, oil, clothing, etc.).
• May be ignited by heat, sparks or flames.
• May burn rapidly with flare-burning effect.
• Containers may explode when heated.
• Runoff may create fire or explosion hazard.

HEALTH
• Fire may produce irritating, corrosive and/or toxic gases.
• Ingestion or contact (skin, eyes) with substance may cause severe injury or burns.
• Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
• CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
• As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
• Keep unauthorized personnel away.
• Stay upwind, uphill and/or upstream.

PROTECTIVE CLOTHING
• Wear positive pressure self-contained breathing apparatus (SCBA).
• Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
• Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

EVACUATION
Immediate precautionary measure
Large Spill
• Consider initial evacuation for at least 250 metres (800 feet) in all directions.

Fire
• If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE
Small Fire
- Water spray or fog is preferred; if water not available use dry chemical, CO₂ or regular foam.

Large Fire
- Flood fire area with water from a distance.
- Use water spray or fog; do not use straight streams.
- Do not move cargo or vehicle if cargo has been exposed to heat.
- Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- Keep combustibles (wood, paper, oil, etc.) away from spilled material.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Keep substance wet using water spray.
- Stop leak if you can do it without risk.

Small Spill
- Pick up with inert, damp, non-combustible material using clean, non-sparking tools and place into loosely covered plastic containers for later disposal.

Large Spill
- Wet down with water and dike for later disposal.
- Prevent entry into waterways, sewers, basements or confined areas.
- DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Contaminated clothing may be a fire risk when dry.
- Remove material from skin immediately.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Keep victim calm and warm.
**POTENTIAL HAZARDS**

**FIRE OR EXPLOSION**
- Lithium ion batteries contain flammable liquid electrolyte that may vent, ignite and produce sparks when subjected to high temperatures (> 150 °C (302 °F)), when damaged or abused (e.g., mechanical damage or electrical overcharging).
- May burn rapidly with flare-burning effect.
- May ignite other batteries in close proximity.

**HEALTH**
- Contact with battery electrolyte may be irritating to skin, eyes and mucous membranes.
- Fire will produce irritating, corrosive and/or toxic gases.
- Burning batteries may produce toxic hydrogen fluoride gas (see GUIDE 125).
- Fumes may cause dizziness or suffocation.

**PUBLIC SAFETY**
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 25 metres (75 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate closed spaces before entering.

**PROTECTIVE CLOTHING**
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

**EVACUATION**
- **Immediate precautionary measure**
- **Large Spill**
  - Consider initial downwind evacuation for at least 100 metres (330 feet).
- **Fire**
  - If rail car or trailer is involved in a fire, ISOLATE for 500 metres (1/3 mile) in all directions; also initiate evacuation including emergency responders for 500 metres (1/3 mile) in all directions.
EMERGENCY RESPONSE

FIRE
Small Fire
• Dry chemical, CO$_2$, water spray or regular foam.
Large Fire
• Water spray, fog or regular foam.
• Move containers from fire area if you can do it without risk.

SPILL OR LEAK
• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
• Do not touch or walk through spilled material.
• Absorb with earth, sand or other non-combustible material.
• Leaking batteries and contaminated absorbent material should be placed in metal containers.

FIRST AID
• Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
• Move victim to fresh air.
• Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
• Give artificial respiration if victim is not breathing.
• Administer oxygen if breathing is difficult.
• Remove and isolate contaminated clothing and shoes.
• In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
POTENTIAL HAZARDS

FIRE OR EXPLOSION
- May explode from heat, contamination or loss of temperature control.
- These materials are particularly sensitive to temperature rises. Above a given "Control Temperature" they decompose violently and catch fire.
- May ignite combustibles (wood, paper, oil, clothing, etc.).
- May ignite spontaneously if exposed to air.
- May be ignited by heat, sparks or flames.
- May burn rapidly with flare-burning effect.
- Containers may explode when heated.
- Runoff may create fire or explosion hazard.

HEALTH
- Fire may produce irritating, corrosive and/or toxic gases.
- Ingestion or contact (skin, eyes) with substance may cause severe injury or burns.
- Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- DO NOT allow the substance to warm up. Obtain liquid nitrogen (wear thermal protective clothing, see GUIDE 120), dry ice or ice for cooling. If this is not possible or none can be obtained, evacuate the area immediately.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

EVACUATION
Immediate precautionary measure
Large Spill
- Consider initial evacuation for at least 250 metres (800 feet) in all directions.

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE
- The temperature of the substance must be maintained at or below the “Control Temperature” at all times.

Small Fire
- Water spray or fog is preferred; if water not available use dry chemical, CO₂ or regular foam.

Large Fire
- Flood fire area with water from a distance.
- Use water spray or fog; do not use straight streams.
- Do not move cargo or vehicle if cargo has been exposed to heat.
- Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- BEWARE OF POSSIBLE CONTAINER EXPLOSION.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- Keep combustibles (wood, paper, oil, etc.) away from spilled material.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.

Small Spill
- Pick up with inert, damp, non-combustible material using clean, non-sparking tools and place into loosely covered plastic containers for later disposal.

Large Spill
- Dike far ahead of liquid spill for later disposal.
- Prevent entry into waterways, sewers, basements or confined areas.
- DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Contaminated clothing may be a fire risk when dry.
- Remove material from skin immediately.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Keep victim calm and warm.
POTENTIAL HAZARDS

FIRE OR EXPLOSION
- Self-decomposition, self-polymerisation, or self-ignition may be triggered by heat, chemical reaction, friction or impact.
- May be ignited by heat, sparks or flames.
- Some may decompose explosively when heated or involved in a fire.
- Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.
- May burn violently. Decomposition or polymerisation may be self-accelerating and produce large amounts of gases.
- Vapours or dust may form explosive mixtures with air.

HEALTH
- Inhalation or contact with vapours, substance or decomposition products may cause severe injury or death.
- May produce irritating, toxic and/or corrosive gases.
- Runoff from fire control may cause pollution.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

EVACUATION
Immediate precautionary measure
Large Spill
- Consider initial evacuation for at least 250 metres (800 feet) in all directions.

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

Small Fire
- Dry chemical, CO₂, water spray or regular foam.

Large Fire
- Flood fire area with water from a distance.
- Move containers from fire area if you can do it without risk.

Fire Involving Tanks or Car/Trailer Loads
- BEWARE OF POSSIBLE CONTAINER EXPLOSION.
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.

Small Spill
- Pick up with inert, damp, non-combustible material using clean, non-sparking tools and place into loosely covered plastic containers for later disposal.
- Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Keep victim calm and warm.
**POTENTIAL HAZARDS**

**FIRE OR EXPLOSION**
- Self-decomposition, self-polymerisation, or self-ignition may be triggered by heat, chemical reaction, friction or impact.
- Self-accelerating decomposition may occur if the specific control temperature is not maintained.
- These materials are particularly sensitive to temperature rises. Above a given "Control Temperature" they decompose or polymerize violently and may catch fire.
- May be ignited by heat, sparks or flames.
- Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.
- Some may decompose explosively when heated or involved in a fire.
- May burn violently. Decomposition or polymerisation may be self-accelerating and produce large amounts of gases.
- Vapours or dust may form explosive mixtures with air.

**HEALTH**
- Inhalation or contact with vapours, substance or decomposition products may cause severe injury or death.
- May produce irritating, toxic and/or corrosive gases.
- Runoff from fire control may cause pollution.

**PUBLIC SAFETY**
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- DO NOT allow the substance to warm up. Obtain liquid nitrogen (wear thermal protective clothing, see GUIDE 120), dry ice or ice for cooling. If this is not possible or none can be obtained, evacuate the area immediately.

**PROTECTIVE CLOTHING**
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

**EVACUATION**

**Immediate precautionary measures**

**Large Spill**
- Consider initial evacuation for at least 250 metres (800 feet) in all directions.

**Fire**
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
**FIRE**

- The temperature of the substance must be maintained at or below the “Control Temperature” at all times.

**Small Fire**
- Dry chemical, CO₂, water spray or regular foam.

**Large Fire**
- Flood fire area with water from a distance.
- Move containers from fire area if you can do it without risk.

**Fire involving Tanks or Car/Trailer Loads**
- BEWARE OF POSSIBLE CONTAINER EXPLOSION.
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.

**SPILL OR LEAK**

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.

**Small Spill**
- Pick up with inert, damp, non-combustible material using clean, non-sparking tools and place into loosely covered plastic containers for later disposal.
- Prevent entry into waterways, sewers, basements or confined areas.
- DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.

**FIRST AID**

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Keep victim calm and warm.
**GUIDE**  
**Substances - Toxic (Non-Combustible)**

### POTENTIAL HAZARDS

#### HEALTH
- Highly toxic, may be fatal if inhaled, swallowed or absorbed through skin.
- Avoid any skin contact.
- Effects of contact or inhalation may be delayed.
- Fire may produce irritating, corrosive and/or toxic gases.
- Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

#### FIRE OR EXPLOSION
- Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.
- Containers may explode when heated.
- Runoff may pollute waterways.

#### PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.

#### PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

#### EVACUATION

**Immediate precautionary measure**

**Spill**
- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials.
- For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

**Fire**
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

Small Fire
- Dry chemical, CO\textsubscript{2} or water spray.

Large Fire
- Water spray, fog or regular foam.
- Move containers from fire area if you can do it without risk.
- Dike fire-control water for later disposal; do not scatter the material.
- Use water spray or fog; do not use straight streams.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Do not get water inside containers.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.
- Cover with plastic sheet to prevent spreading.
- Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- DO NOT GET WATER INSIDE CONTAINERS.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- For minor skin contact, avoid spreading material on unaffected skin.
- Keep victim calm and warm.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
**POTENTIAL HAZARDS**

**HEALTH**
- Highly toxic, may be fatal if inhaled, swallowed or absorbed through skin.
- Contact with molten substance may cause severe burns to skin and eyes.
- Avoid any skin contact.
- Effects of contact or inhalation may be delayed.
- Fire may produce irritating, corrosive and/or toxic gases.
- Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

**FIRE OR EXPLOSION**
- Combustible material: may burn but does not ignite readily.
- Containers may explode when heated.
- Runoff may pollute waterways.
- Substance may be transported in a molten form.

**PUBLIC SAFETY**
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.

**PROTECTIVE CLOTHING**
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

**EVACUATION**

**Spill**
- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials.
  For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

**Fire**
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
## EMERGENCY RESPONSE

### FIRE

**Small Fire**
- Dry chemical, CO₂ or water spray.

**Large Fire**
- Water spray, fog or regular foam.
- Move containers from fire area if you can do it without risk.
- Dike fire-control water for later disposal; do not scatter the material.
- Use water spray or fog; do not use straight streams.

### Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Do not get water inside containers.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

### SPILL OR LEAK
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.
- Cover with plastic sheet to prevent spreading.
- Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- DO NOT GET WATER INSIDE CONTAINERS.

### FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- For minor skin contact, avoid spreading material on unaffected skin.
- Keep victim calm and warm.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
POTENTIAL HAZARDS

HEALTH

- TOXIC: inhalation, ingestion or skin contact with material may cause severe injury or death.
- Contact with molten substance may cause severe burns to skin and eyes.
- Avoid any skin contact.
- Effects of contact or inhalation may be delayed.
- Fire may produce irritating, corrosive and/or toxic gases.
- Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

FIRE OR EXPLOSION

- Combustible material: may burn but does not ignite readily.
- When heated, vapours may form explosive mixtures with air: indoors, outdoors and sewers explosion hazards.
- Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.
- Contact with metals may evolve flammable hydrogen gas.
- Containers may explode when heated.
- Runoff may pollute waterways.
- Substance may be transported in a molten form.

PUBLIC SAFETY

- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate enclosed areas.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION

Immediate precautionary measure

Spill

- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials. For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

Small Fire
- Dry chemical, CO₂ or water spray.

Large Fire
- Dry chemical, CO₂, alcohol-resistant foam or water spray.
- Move containers from fire area if you can do it without risk.
- Dike fire-control water for later disposal; do not scatter the material.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Do not get water inside containers.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.
- Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- DO NOT GET WATER INSIDE CONTAINERS.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- For minor skin contact, avoid spreading material on unaffected skin.
- Keep victim calm and warm.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
POTENTIAL HAZARDS

HEALTH

- TOXIC; inhalation, ingestion or skin contact with material may cause severe injury or death.
- Contact with molten substance may cause severe burns to skin and eyes.
- Avoid any skin contact.
- Effects of contact or inhalation may be delayed.
- Fire may produce irritating, corrosive and/or toxic gases.
- Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

FIRE OR EXPLOSION

- Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.
- Some are oxidisers and may ignite combustibles (wood, paper, oil, clothing, etc.).
- Contact with metals may evolve flammable hydrogen gas.
- Containers may explode when heated.
- For electric vehicles or equipment, GUIDE 147 (lithium ion batteries) or GUIDE 138 (sodium batteries) should also be consulted.

PUBLIC SAFETY

- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate enclosed areas.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION

Immediate precautionary measure

Spill

- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials. For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE
Small Fire
• Dry chemical, CO₂ or water spray.

Large Fire
• Dry chemical, CO₂, alcohol-resistant foam or water spray.
• Move containers from fire area if you can do it without risk.
• Dike fire-control water for later disposal; do not scatter the material.

Fire involving Tanks or Car/Trailer Loads
• Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
• Do not get water inside containers.
• Cool containers with flooding quantities of water until well after fire is out.
• Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
• ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
• Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
• Stop leak if you can do it without risk.
• Prevent entry into waterways, sewers, basements or confined areas.
• Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
• DO NOT GET WATER INSIDE CONTAINERS.

FIRST AID
• Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
• Move victim to fresh air.
• Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
• Give artificial respiration if victim is not breathing.
• Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
• Administer oxygen if breathing is difficult.
• Remove and isolate contaminated clothing and shoes.
• In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
• For minor skin contact, avoid spreading material on unaffected skin.
• Keep victim calm and warm.
• Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
POTENTIAL HAZARDS

FIRE OR EXPLOSION
- HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
- Vapours form explosive mixtures with air: indoors, outdoors and sewers explosion hazards.
- Most vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Vapours may travel to source of ignition and flash back.
- Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.
- Substance will react with water (some violently) releasing flammable, toxic or corrosive gases and runoff.
- Contact with metals may evolve flammable hydrogen gas.
- Containers may explode when heated or if contaminated with water.

HEALTH
- TOXIC; inhalation, ingestion or contact (skin, eyes) with vapours, dusts or substance may cause severe injury, burns or death.
- Bromoacetates and chloroacetates are extremely irritating/lachrymators.
- Reaction with water or moist air will release toxic, corrosive or flammable gases.
- Reaction with water may generate much heat that will increase the concentration of fumes in the air.
- Fire will produce irritating, corrosive and/or toxic gases.
- Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate enclosed areas.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION
Immediate precautionary measure
Spill
- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials. For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

- Note: Most foams will react with the material and release corrosive/toxic gases. CAUTION: For Acetyl chloride (UN1717), use CO₂ or dry chemical only.
  
  **Small Fire**
  - CO₂, dry chemical, dry sand, alcohol-resistant foam.
  
  **Large Fire**
  - Water spray, fog or alcohol-resistant foam.
  - FOR CHLOROSILANES, DO NOT USE WATER; use AFFF alcohol-resistant medium-expansion foam.
  - Move containers from fire area if you can do it without risk.
  - Use water spray or fog; do not use straight streams.

**Fire involving Tanks or Car/Trailer Loads**

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Do not get water inside containers.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Stop leak if you can do it without risk.
  - A vapour-suppressing foam may be used to reduce vapours.
  - FOR CHLOROSILANES, use AFFF alcohol-resistant medium-expansion foam to reduce vapours.
  - DO NOT GET WATER on spilled substance or inside containers.
  - Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
  - Prevent entry into waterways, sewers, basements or confined areas.

**Small Spill**

- Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.
- Use clean, non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal.

FIRST AID

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- For minor skin contact, avoid spreading material on unaffected skin.
- Keep victim calm and warm.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
**POTENTIAL HAZARDS**

**FIRE OR EXPLOSION**
- Combustible material: may burn but does not ignite readily.
- Substance will react with water (some violently) releasing flammable, toxic or corrosive gases and runoff.
- When heated, vapours may form explosive mixtures with air: indoors, outdoors and sewers explosion hazards.
- Most vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Vapours may travel to source of ignition and flash back.
- Contact with metals may evolve flammable hydrogen gas.
- Containers may explode when heated or if contaminated with water.

**HEALTH**
- TOXIC; inhalation, ingestion or contact (skin, eyes) with vapours, dusts or substance may cause severe injury, burns or death.
- Contact with molten substance may cause severe burns to skin and eyes.
- Reaction with water or moist air will release toxic, corrosive or flammable gases.
- Reaction with water may generate much heat that will increase the concentration of fumes in the air.
- Fire will produce irritating, corrosive and/or toxic gases.
- Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

**PUBLIC SAFETY**
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate enclosed areas.

**PROTECTIVE CLOTHING**
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

**EVACUATION**

Immediate precautionary measure
- Spill
  - See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials.
  - For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.
- Fire
  - If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
**EMERGENCY RESPONSE**

**FIRE**

- Note: Most foams will react with the material and release corrosive/toxic gases.

  **Small Fire**
  - CO₂, dry chemical, dry sand, alcohol-resistant foam.

  **Large Fire**
  - Water spray, fog or alcohol-resistant foam.
  - FOR CHLOROSILANES, DO NOT USE WATER; use AFFF alcohol-resistant medium-expansion foam.
  - Move containers from fire area if you can do it without risk.
  - Use water spray or fog; do not use straight streams.

**Fire involving Tanks or Car/Trailer Loads**

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Do not get water inside containers.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.

**SPILL OR LEAK**

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Stop leak if you can do it without risk.
- A vapour-suppressing foam may be used to reduce vapours.
- FOR CHLOROSILANES, use AFFF alcohol-resistant medium-expansion foam to reduce vapours.
- DO NOT GET WATER on spilled substance or inside containers.
- Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
- Prevent entry into waterways, sewers, basements or confined areas.

  **Small Spill**
  - Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.
  - Use clean, non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal.

**FIRST AID**

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- For minor skin contact, avoid spreading material on unaffected skin.
- Keep victim calm and warm.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
POTENTIAL HAZARDS

HEALTH
- TOXIC; inhalation, ingestion or contact (skin, eyes) with vapours, dusts or substance may cause severe injury, burns or death.
- Reaction with water or moist air may release toxic, corrosive or flammable gases.
- Reaction with water may generate much heat that will increase the concentration of fumes in the air.
- Fire will produce irritating, corrosive and/or toxic gases.
- Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

FIRE OR EXPLOSION
- Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.
- For UN1796, UN1802, UN1826, UN2032, UN3084, UN3085 at high concentrations above 65, UN2031 may act as oxidisers, also consult GUIDE 140.
- Vapours may accumulate in confined areas (basement, tanks, hopper/tank cars, etc.).
- Substance may react with water (some violently), releasing corrosive and/or toxic gases and runoff.
- Contact with metals may evolve flammable hydrogen gas.
- Containers may explode when heated or if contaminated with water.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate enclosed areas.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION
Immediate precautionary measure
Spill
- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials.
- For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE
- Note: Some foams will react with the material and release corrosive/toxic gases.
- **Small Fire**
  - CO$_2$ (except for Cyanides), dry chemical, dry sand, alcohol-resistant foam.
- **Large Fire**
  - Water spray, fog or alcohol-resistant foam.
  - Move containers from fire area if you can do it without risk.
  - Use water spray or fog; do not use straight streams.
  - Dike fire-control water for later disposal; do not scatter the material.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Do not get water inside containers.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Stop leak if you can do it without risk.
- A vapour-suppressing foam may be used to reduce vapours.
- DO NOT GET WATER INSIDE CONTAINERS.
- Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
- Prevent entry into waterways, sewers, basements or confined areas.

Small Spill
- Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.
- Use clean, non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- In case of contact with Hydrofluoric acid (UN1790), flush with large amounts of water. For skin contact, if calcium gluconate gel is available, rinse 5 minutes, then apply gel. Otherwise, continue rinsing until medical treatment is available. For eyes, flush with water or a saline solution for 15 minutes.
- For minor skin contact, avoid spreading material on unaffected skin.
- Keep victim calm and warm.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
POTENTIAL HAZARDS

HEALTH
- Inhalation or contact with substance may cause infection, disease or death.
- Category A Infections Substances (UN2814, UN2900 or UN3549) are more hazardous, or are in a more hazardous form, than infectious substances shipped as Category B Biological Substances (UN3373) or clinical waste / medical waste (UN3291).
- Runoff from fire control may cause environmental contamination.
- Note: Damaged packages containing solid CO₂ as a refrigerant may produce water or frost from condensation of air. Do not touch this solid or liquid as it could be contaminated by the contents of the parcel.
- Contact with solid CO₂ may cause burns, severe injury and/or frostbite.

FIRE OR EXPLOSION
- Some of these materials may burn, but none ignite readily.
- Some may be transported in flammable liquids.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 25 metres (75 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Identify the substance involved.

PROTECTIVE CLOTHING
- Wear respiratory protection, such as fit-tested N95 respirator (at minimum), powered air purifying respirator (PAPR), or positive pressure self-contained breathing apparatus (SCBA).
- Wear full coverage body protection (e.g., Tyvek suit), faceshield, and disposable fluid-resistant gloves (e.g., latex or nitrile).
- Wear appropriate footwear; disposable shoe covers can be worn to protect against contamination.
- Puncture- and cut-resistant gloves should be worn over fluid-resistant gloves if sharp objects (e.g., broken glass, needles) are present.
- Wear insulated gloves (e.g. cryo gloves) over fluid-resistant gloves when handling dry ice (UN1845).
- Decontaminate protective clothing and personal protective equipment after use and before cleaning or disposal with an appropriate chemical disinfectant (e.g., 10% solution of bleach, equivalent to 0.5% sodium hypochlorite) or through a validated decontamination technology (e.g., autoclave) or process.
- Structural firefighters' protective clothing will provide thermal protection but provides only limited chemical protection.
EMERGENCY RESPONSE

FIRE

Small Fire
• Dry chemical, soda ash, lime or sand.

Large Fire
• Use extinguishing agent suitable for type of surrounding fire.
• Do not scatter spilled material with high-pressure water streams.
• Move containers from fire area if you can do it without risk.

SPILL OR LEAK
• Do not touch or walk through spilled material.
• Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
• Absorb with earth, sand or other non-combustible material.
• Cover damaged package or spilled material with absorbent material such as paper towel, towel or rag to absorb any liquids, and, beginning from outside edge, pour liquid bleach or other chemical disinfectant to saturate. Keep wet with liquid bleach or other disinfectant.
• DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.

FIRST AID
• Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
• Move victim to a safe isolated area.
CAUTION: Victim may be a source of contamination.
• Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
• Remove and isolate contaminated clothing and shoes.
• In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
• Effects of exposure (inhalation, ingestion, injection/inoculation or skin contact) to substance may be delayed. Victim should consult medical professional for information regarding symptoms and treatment.
• For further assistance, contact your local Poison Control Centre.
**HEALTH**

- Inhalation of vapours or dust is extremely irritating.
- May cause burning of eyes and flow of tears.
- May cause coughing, difficult breathing and nausea.
- Brief exposure effects last only a few minutes.
- Exposure in an enclosed area may be very harmful.
- Fire will produce irritating, corrosive and/or toxic gases.
- Runoff from fire control or dilution water may cause pollution.

**FIRE OR EXPLOSION**

- Some of these materials may burn, but none ignite readily.
- Containers may explode when heated.

**PUBLIC SAFETY**

- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate closed spaces before entering.

**PROTECTIVE CLOTHING**

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

**EVACUATION**

**Immediate precautionary measure**

**Spill**

- See [Table 1 - Initial Isolation and Protective Action Distances] for highlighted materials. For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

**Fire**

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

Small Fire
- Dry chemical, CO₂, water spray or regular foam.

Large Fire
- Water spray, fog or regular foam.
- Move containers from fire area if you can do it without risk.
- Dike fire-control water for later disposal; do not scatter the material.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Do not get water inside containers.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.

Small Spill
- Pick up with sand or other non-combustible absorbent material and place into containers for later disposal.

Large Spill
- Dike far ahead of liquid spill for later disposal.
- Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- For minor skin contact, avoid spreading material on unaffected skin.
- Keep victim calm and warm.
- Effects should disappear after individual has been exposed to fresh air for approximately 10 minutes.
### POTENTIAL HAZARDS

#### HEALTH
- Toxic by ingestion.
- Vapours may cause dizziness or suffocation.
- Exposure in an enclosed area may be very harmful.
- Contact may irritate or burn skin and eyes.
- Fire may produce irritating and/or toxic gases.
- Runoff from fire control or dilution water may cause pollution.

#### FIRE OR EXPLOSION
- Some of these materials may burn, but none ignite readily.
- Most vapours are heavier than air.
- Air/vapour mixtures may explode when ignited.
- Container may explode in heat of fire.

#### PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 50 metres (150 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Ventilate closed spaces before entering.

#### PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire.
- Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

#### EVACUATION
**Immediate precautionary measure**

**Large Spill**
- Consider initial downwind evacuation for at least 100 metres (330 feet).

**Fire**
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2 mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.
EMERGENCY RESPONSE

FIRE

Small Fire
- Dry chemical, CO₂ or water spray.

Large Fire
- Dry chemical, CO₂, alcohol-resistant foam or water spray.
- Move containers from fire area if you can do it without risk.
- Dike fire-control water for later disposal; do not scatter the material.

Fire involving Tanks or Car/Trailer Loads
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- Stop leak if you can do it without risk.

Small Liquid Spill
- Pick up with sand, earth or other non-combustible absorbent material.

Large Spill
- Dike far ahead of liquid spill for later disposal.
- Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- For minor skin contact, avoid spreading material on unaffected skin.
- Wash skin with soap and water.
- Keep victim calm and warm.
POTENTIAL HAZARDS

HEALTH

- Radiation presents minimal risk to transport workers, emergency response personnel and the public during transportation accidents. Packaging durability increases as potential hazard of radioactive content increases.
- Very low levels of contained radioactive materials and low radiation levels outside packages result in low risks to people. Damaged packages may release measurable amounts of radioactive material, but the resulting risks are expected to be low.
- Some radioactive materials cannot be detected by commonly available instruments.
- Packages do not have RADIOACTIVE I, II, or III labels. Some may have EMPTY labels or may have the word “Radioactive” in the package marking.

FIRE OR EXPLOSION

- Some of these materials may burn, but most do not ignite readily.
- Many have cardboard outer packaging; content (physically large or small) can be of many different physical forms.
- Radioactivity does not change flammability or other properties of materials.

PUBLIC SAFETY

- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- Priorities for rescue, life-saving, first aid, fire control and other hazards are higher than the priority for measuring radiation levels.
- Radiation Authority must be notified of accident conditions. Radiation Authority is usually responsible for decisions about radiological consequences and closure of emergencies.
- As an immediate precautionary measure, isolate spill or leak area for at least 25 metres (75 feet) in all directions.
- Stay upwind, uphill and/or upstream.
- Keep unauthorized personnel away.
- Detain or isolate uninjured persons or equipment suspected to be contaminated; delay decontamination and cleanup until instructions are received from Radiation Authority.

PROTECTIVE CLOTHING

- Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters’ protective clothing will provide adequate protection.

EVACUATION

Immediate precautionary measure

Large Spill
- Consider initial downwind evacuation for at least 100 metres (330 feet).

Fire
- When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 metres (1000 feet) in all directions.
EMERGENCY RESPONSE

FIRE
• Presence of radioactive material will not influence the fire control processes and should not influence selection of techniques.
• Move containers from fire area if you can do it without risk.
• Do not move damaged packages; move undamaged packages out of fire zone.

Small Fire
• Dry chemical, CO₂, water spray or regular foam.

Large Fire
• Water spray, fog (flooding amounts).

SPILL OR LEAK
• Do not touch damaged packages or spilled material.
• Cover liquid spill with sand, earth or other non-combustible absorbent material.
• Cover powder spill with plastic sheet or tarp to minimize spreading.

FIRST AID
• Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.
• Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
• Medical problems take priority over radiological concerns.
• Use first aid treatment according to the nature of the injury.
• Do not delay care and transport of a seriously injured person.
• Give artificial respiration if victim is not breathing.
• Administer oxygen if breathing is difficult.
• In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
• Injured persons contaminated by contact with released material are not a serious hazard to health care personnel, equipment or facilities.
POTENTIAL HAZARDS

HEALTH
- Radiation presents minimal risk to transport workers, emergency response personnel and the public during transportation accidents. Packaging durability increases as potential hazard of radioactive content increases.
- Undamaged packages are safe. Contents of damaged packages may cause higher external radiation exposure, or both external and internal radiation exposure if contents are released.
- Low radiation hazard when material is inside container. If material is released from package or bulk container, hazard will vary from low to moderate. Level of hazard will depend on the type and amount of radioactivity, the kind of material it is in, and/or the surfaces it is on.
- Some material may be released from packages during accidents of moderate severity but risks to people are not great.
- Released radioactive materials or contaminated objects usually will be visible if packaging fails.
- Some exclusive use shipments of bulk and packaged materials will not have “RADIOACTIVE” labels. Placards, markings and Transport Documents provide identification.
- Some packages may have a “RADIOACTIVE” label and a second hazard label. The second hazard is usually greater than the radiation hazard; so follow this GUIDE as well as the response GUIDE for the second hazard class label.
- Some radioactive materials cannot be detected by commonly available instruments.
- Some radioactive materials may be transported unpackaged. E.g. UN 2912 (LSA-I) and UN 2913 (SCO-I)

FIRE OR EXPLOSION
- Some of these materials may burn, but most do not ignite readily.
- Uranium and Thorium metal cuttings may ignite spontaneously if exposed to air (see GUIDE 136).
- Nitrates are oxidisers and may ignite other combustibles (see GUIDE 141).

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- Priorities for rescue, life-saving, first aid, fire control and other hazards are higher than the priority for measuring radiation levels.
- Radiation Authority must be notified of accident conditions. Radiation Authority is usually responsible for decisions about radiological consequences and closure of emergencies.
- As an immediate precautionary measure, isolate spill or leak area for at least 25 metres (75 feet) in all directions.
- Stay upwind, uphill and/or upstream.
- Keep unauthorized personnel away.
- Detain or isolate uninjured persons or equipment suspected to be contaminated; delay decontamination and cleanup until instructions are received from Radiation Authority.

PROTECTIVE CLOTHING
- Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters’ protective clothing will provide adequate protection.

EVACUATION
Immediate precautionary measure
Large Spill
- Consider initial downwind evacuation for at least 100 metres (330 feet).
Fire
- When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 metres (1000 feet) in all directions.
EMERGENCY RESPONSE

FIRE
- Presence of radioactive material will not influence the fire control processes and should not influence selection of techniques.
- Move containers from fire area if you can do it without risk.
- Do not move damaged packages; move undamaged packages out of fire zone.

Small Fire
- Dry chemical, CO$_2$, water spray or regular foam.

Large Fire
- Water spray, fog (flooding amounts).
- Dike fire-control water for later disposal.

SPILL OR LEAK
- Do not touch damaged packages or spilled material.
- Cover liquid spill with sand, earth or other non-combustible absorbent material.
- Dike to collect large liquid spills.
- Cover powder spill with plastic sheet or tarp to minimize spreading.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Medical problems take priority over radiological concerns.
- Use first aid treatment according to the nature of the injury.
- Do not delay care and transport of a seriously injured person.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- In case of contact with substance, wipe from skin immediately; flush skin or eyes with running water for at least 20 minutes.
- Injured persons contaminated by contact with released material are not a serious hazard to health care personnel, equipment or facilities.
POTENTIAL HAZARDS

HEALTH

- Radiation presents minimal risk to transport workers, emergency response personnel and the public during transportation accidents. Packaging durability increases as potential hazard of radioactive content increases.
- Undamaged packages are safe. Contents of damaged packages may cause higher external radiation exposure, or both external and internal radiation exposure if contents are released.
- Type A packages (cartons, boxes, drums, articles, etc.) identified as "Type A" by marking on packages or by Transport Documents contain non-life-endangering amounts. Partial releases might be expected if "Type A" packages are damaged in moderately severe accidents.
- Type B packages, and the rarely occurring Type C packages (large and small, usually metal), contain the most hazardous amounts. They can be identified by package markings or by Transport Documents. Life-threatening conditions may exist only if contents are released or package shielding fails. Because of design, evaluation and testing of packages, these conditions would be expected only for accidents of utmost severity.
- The rarely occurring "Special Arrangement" shipments may be of Type A, Type B or Type C packages. Package type will be marked on packages, and shipment details will be on Transport Documents.
- Radioactive White-I labels indicate radiation levels outside single, isolated, undamaged packages are very low (less than 0.005 mSv/h (0.5 mrem/h)).
- Radioactive Yellow-II and Yellow-III labeled packages have higher radiation levels. The transport index (TI) on the label identifies the maximum radiation level in mrem/h one metre from a single, isolated, undamaged package.
- Some radioactive materials cannot be detected by commonly available instruments.
- Water from cargo fire control may cause pollution.

FIRE OR EXPLOSION

- Some of these materials may burn, but most do not ignite readily.
- Radioactivity does not change flammability or other properties of materials.
- Type B packages are designed and evaluated to withstand total engulfment in flames at temperatures of 800°C (1475°F) for a period of 30 minutes.

PUBLIC SAFETY

- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- Priorities for rescue, life-saving, first aid, fire control and other hazards are higher than the priority for measuring radiation levels.
- Radiation Authority must be notified of accident conditions. Radiation Authority is usually responsible for decisions about radiological consequences and closure of emergencies.
- As an immediate precautionary measure, isolate spill or leak area for at least 25 metres in all directions.
- Stay upwind, uphill and/or upstream.
- Keep unauthorized personnel away.
- Detain or isolate uninjured persons or equipment suspected to be contaminated; delay decontamination and cleanup until instructions are received from Radiation Authority.

PROTECTIVE CLOTHING

- Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters’ protective clothing will provide adequate protection against internal radiation exposure, but not external radiation exposure.

EVACUATION

Large Spill
- Consider initial downwind evacuation for at least 100 metres.

Fire
- When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 metres in all directions.
## EMERGENCY RESPONSE

### FIRE
- Presence of radioactive material will not influence the fire control processes and should not influence selection of techniques.
- Move containers from fire area if you can do it without risk.
- Do not move damaged packages; move undamaged packages out of fire zone.

#### Small Fire
- Dry chemical, CO$_2$, water spray or regular foam.

#### Large Fire
- Water spray, fog (flooding amounts).
- Dike fire-control water for later disposal.

### SPILL OR LEAK
- Do not touch damaged packages or spilled material.
- Damp surfaces on undamaged or slightly damaged packages are seldom an indication of packaging failure. Most packaging for liquid content have inner containers and/or inner absorbent materials.
- Cover liquid spill with sand, earth or other non-combustible absorbent material.

### FIRST AID
- Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Medical problems take priority over radiological concerns.
- Use first aid treatment according to the nature of the injury.
- Do not delay care and transport of a seriously injured person.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Injured persons contaminated by contact with released material are not a serious hazard to health care personnel, equipment or facilities.
HEALTH
- Radiation presents minimal risk to transport workers, emergency response personnel and the public during transportation accidents. Packaging durability increases as potential hazard of radioactive content increases.
- Undamaged packages are safe; contents of damaged packages may cause external radiation exposure, and much higher external exposure if contents (source capsules) are released.
- Contamination and internal radiation hazards are not expected, but not impossible.
- Type A packages (cartons, boxes, drums, articles, etc.) identified as “Type A” by marking on packages or by Transport Documents contain non-life-endangering amounts. Radioactive sources may be released if “Type A” packages are damaged in moderately severe accidents.
- Type B packages, and the rarely occurring Type C packages, (large and small, usually metal) contain the most hazardous amounts. They can be identified by package markings or by Transport Documents. Life-threatening conditions may exist only if contents are released or package shielding fails. Because of design, evaluation and testing of packages, these conditions would be expected only for accidents of utmost severity.
- Radioactive White-I labels indicate radiation levels outside single, isolated, undamaged packages are very low (less than 0.005 mSv/h (0.5 mrem/h)).
- Radioactive Yellow-II and Yellow-III labeled packages have higher radiation levels. The transport index (TI) on the label identifies the maximum radiation level in mrem/h one metre from a single, isolated, undamaged package.
- Radiation from the package contents, usually in durable metal capsules, can be detected by most radiation instruments.
- Water from cargo fire control is not expected to cause pollution.

FIRE OR EXPLOSION
- Packagings can burn completely without risk of content loss from sealed source capsule.
- Radioactivity does not change flammability or other properties of materials.
- Radioactive source capsules and Type B packages are designed and evaluated to withstand total engulfment in flames at temperatures of 800°C (1475°F) for a period of 30 minutes.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- Priorities for rescue, life-saving, first aid, fire control and other hazards are higher than the priority for measuring radiation levels.
- Radiation Authority must be notified of accident conditions. Radiation Authority is usually responsible for decisions about radiological consequences and closure of emergencies.
- As an immediate precautionary measure, isolate spill or leak area for at least 25 metres in all directions.
- Stay upwind, uphill and/or upstream.
- Keep unauthorized personnel away.
- Delay final cleanup until instructions or advice is received from Radiation Authority.

PROTECTIVE CLOTHING
- Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters’ protective clothing will provide adequate protection against internal radiation exposure, but not external radiation exposure.

EVACUATION
Immediate precautionary measure
Large Spill
- Consider initial downwind evacuation for at least 100 metres.

Fire
- When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 metres in all directions.
EMERGENCY RESPONSE

FIRE
- Presence of radioactive material will not influence the fire control processes and should not influence selection of techniques.
- Move containers from fire area if you can do it without risk.
- Do not move damaged packages; move undamaged packages out of fire zone.

Small Fire
- Dry chemical, CO₂, water spray or regular foam.

Large Fire
- Water spray, fog (flooding amounts).

SPILL OR LEAK
- Do not touch damaged packages or spilled material.
- Damp surfaces on undamaged or slightly damaged packages are seldom an indication of packaging failure. Contents are seldom liquid. Content is usually a metal capsule, easily seen if released from package.
- If source capsule is identified as being out of package, DO NOT TOUCH. Stay away and await advice from Radiation Authority.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Medical problems take priority over radiological concerns.
- Use first aid treatment according to the nature of the injury.
- Do not delay care and transport of a seriously injured person.
- Persons exposed to special form sources are not likely to be contaminated with radioactive material.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Injured persons contaminated by contact with released material are not a serious hazard to health care personnel, equipment or facilities.
POTENTIAL HAZARDS

HEALTH

- Radiation presents minimal risk to transport workers, emergency response personnel and the public during transportation accidents. Packaging durability increases as potential radiation and criticality hazards of the content increase.
- Undamaged packages are safe. Contents of damaged packages may cause higher external radiation exposure, or both external and internal radiation exposure if contents are released.
- Type AF or IF packages, identified by package markings, do not contain life-threatening amounts of material. External radiation levels are low and packages are designed, evaluated and tested to control releases and to prevent a fission chain reaction under severe transport conditions.
- Type B(U)F, B(M)F and CF packages (identified by markings on packages or Transport Documents) contain potentially life-endangering amounts. Because of design, evaluation and testing of packages, fission chain reactions are prevented and releases are not expected to be life-endangering for all accidents except those of utmost severity.
- The rarely occurring "Special Arrangement" shipments may be of Type AF, BF or CF packages. Package type will be marked on packages, and shipment details will be on Transport Documents.
- The transport index (TI) shown on labels or a Transport Document might not indicate the radiation level at one metre from a single, isolated, undamaged package; instead, it might relate to controls needed during transport because of the fissile properties of the materials. Alternatively, the fissile nature of the contents may be indicated by a criticality safety index (CSI) on a special FISSILE label or on the Transport Document.
- Some radioactive materials cannot be detected by commonly available instruments.
- Water from cargo fire control is not expected to cause pollution.

FIRE OR EXPLOSION

- These materials are seldom flammable. Packages are designed to withstand fires without damage to contents.
- Radioactivity does not change flammability or other properties of materials.
- Type AF, IF, B(U)F, B(M)F and CF packages are designed and evaluated to withstand total engulfment in flames at temperatures of 800°C (1475°F) for a period of 30 minutes.

PUBLIC SAFETY

- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- Priorities for rescue, life-saving, first aid, fire control and other hazards are higher than the priority for measuring radiation levels.
- Radiation Authority must be notified of accident conditions. Radiation Authority is usually responsible for decisions about radiological consequences and closure of emergencies.
- As an immediate precautionary measure, isolate spill or leak area for at least 25 metres in all directions.
- Stay upwind, uphill and/or upstream.
- Keep unauthorized personnel away.
- Detain or isolate uninjured persons or equipment suspected to be contaminated; delay decontamination and cleanup until instructions are received from Radiation Authority.

PROTECTIVE CLOTHING

- Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters’ protective clothing will provide adequate protection against internal radiation exposure, but not external radiation exposure.

EVACUATION

Immediate precautionary measure

Large Spill
- Consider initial downwind evacuation for at least 100 metres.

Fire
- When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 metres in all directions.
EMERGENCY RESPONSE

FIRE
- Presence of radioactive material will not influence the fire control processes and should not influence selection of techniques.
- Move containers from fire area if you can do it without risk.
- Do not move damaged packages; move undamaged packages out of fire zone.

Small Fire
- Dry chemical, CO₂, water spray or regular foam.

Large Fire
- Water spray, fog (flooding amounts).

SPILL OR LEAK
- Do not touch damaged packages or spilled material.
- Damp surfaces on undamaged or slightly damaged packages are seldom an indication of packaging failure. Most packaging for liquid content have inner containers and/or inner absorbent materials.

Liquid Spill
- Package contents are seldom liquid. If any radioactive contamination resulting from a liquid release is present, it probably will be low-level.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Medical problems take priority over radiological concerns.
- Use first aid treatment according to the nature of the injury.
- Do not delay care and transport of a seriously injured person.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Injured persons contaminated by contact with released material are not a serious hazard to health care personnel, equipment or facilities.
**POTENTIAL HAZARDS**

**HEALTH**
- Radiation presents minimal risk to transport workers, emergency response personnel and the public during transportation accidents. Packaging durability increases as potential radiation and criticality hazards of the content increase.
- Chemical hazard greatly exceeds radiation hazard.
- Substance reacts with water and water vapour in air to form toxic and corrosive hydrogen fluoride gas and an extremely irritating and corrosive, white-coloured, water-soluble residue.
- If inhaled, may be fatal.
- Direct contact causes burns to skin, eyes, and respiratory tract.
- Low-level radioactive material; very low radiation hazard to people.
- Runoff from control of cargo fire may cause low-level pollution.

**FIRE OR EXPLOSION**
- Substance does not burn.
- The material may react violently with fuels.
- Product will decompose to produce toxic and/or corrosive fumes.
- Containers in protective overpacks (horizontal cylindrical shape with short legs for tie-downs), are identified with "AF", "B(U)F" or "H(U)" on Transport Documents or by markings on the overpacks. They are designed and evaluated to withstand severe conditions including total engulfment in flames at temperatures of 800°C (1475°F) for a period of 30 minutes.
- Bare filled cylinders, identified with UN2978 as part of the marking (may also be marked H(U) or H(M)), may rupture in heat of engulfing fire; bare empty (except for residue) cylinders will not rupture in fires.
- Radioactivity does not change flammability or other properties of materials.

**PUBLIC SAFETY**
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- Priorities for rescue, life-saving, first aid, fire control and other hazards are higher than the priority for measuring radiation levels.
- Radiation Authority must be notified of accident conditions. Radiation Authority is usually responsible for decisions about radiological consequences and closure of emergencies.
- As an immediate precautionary measure, isolate spill or leak area for at least 25 metres in all directions.
- Stay upwind, uphill and/or upstream.
- Keep unauthorized personnel away.
- Detain or isolate uninjured persons or equipment suspected to be contaminated; delay decontamination and cleanup until instructions are received from Radiation Authority.

**PROTECTIVE CLOTHING**
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

**EVACUATION**
- **Immediate precautionary measure**
- **Spill**
  - See Table 1 - Initial Isolation and Protective Action Distances.
- **Fire**
  - When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 metres in all directions.
EMERGENCY RESPONSE

FIRE
• DO NOT USE WATER OR FOAM ON MATERIAL ITSELF.
• Move containers from fire area if you can do it without risk.

Small Fire
• Dry chemical or CO₂.

Large Fire
• Water spray, fog or regular foam.
• Cool containers with flooding quantities of water until well after fire is out.
• If this is impossible, withdraw from area and let fire burn.
• ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
• Do not touch damaged packages or spilled material.
• DO NOT GET WATER INSIDE CONTAINERS.
• Without fire or smoke, leak will be evident by visible and irritating vapours and residue forming at the point of release.
• Use fine water spray to reduce vapours; do not put water directly on point of material release from container.
• Residue buildup may self-seal small leaks.
• Dike far ahead of spill to collect runoff water.

FIRST AID
• Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves.
• Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
• Medical problems take priority over radiological concerns.
• Use first aid treatment according to the nature of the injury.
• In case of contact with Hydrofluoric acid (UN1790), flush with large amounts of water. For skin contact, if calcium gluconate gel is available, rinse 5 minutes, then apply gel. Otherwise, continue rinsing until medical treatment is available. For eyes, flush with water or a saline solution for 15 minutes.
• Do not delay care and transport of a seriously injured person.
• Give artificial respiration if victim is not breathing.
• Administer oxygen if breathing is difficult.
• In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
• Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
• Keep victim calm and warm.
IN AN EMERGENCY, IN AUSTRALIA CALL 000 | IN NEW ZEALAND CALL 111

GUIDE INTENTIONALLY LEFT BLANK
# GUIDE Carbon Monoxide (Refrigerated Liquid)

## POTENTIAL HAZARDS

### HEALTH
- **TOXIC;** Extremely Hazardous.
- Inhalation extremely dangerous; may be fatal.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- odourless, will not be detected by sense of smell.

### FIRE OR EXPLOSION
- **EXTREMELY FLAMMABLE.**
- May be ignited by heat, sparks or flames.
- Flame may be invisible.
- Containers may explode when heated.
- Vapour explosion and poison hazard indoors, outdoors or in sewers.
- Vapours from liquefied gas are initially heavier than air and spread along ground.
- Vapours may travel to source of ignition and flash back.
- Runoff may create fire or explosion hazard.

### PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 100 metres in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Ventilate closed spaces before entering.

### PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters’ protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.
- Always wear thermal protective clothing when handling refrigerated/cryogenic liquids.

### EVACUATION

#### Immediate precautionary measure

**Spill**
- See Table 1 - Initial Isolation and Protective Action Distances.

**Fire**
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres in all directions; also, consider initial evacuation for 800 metres in all directions.
**EMERGENCY RESPONSE**

**FIRE**
- **CAUTION:** Flame can be invisible. Use an alternate method of detection (thermal camera, broom handle, etc.)
- **DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.**

**Small Fire**
- Dry chemical, CO₂ or water spray.

**Large Fire**
- Water spray, fog or regular foam.
- Move containers from fire area if you can do it without risk.

**Fire involving Tanks**
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- **ALWAYS** stay away from tanks engulfed in fire.

**SPILL OR LEAK**
- **ELIMINATE** all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Prevent entry into waterways, sewers, basements or confined areas.
- Isolate area until gas has dispersed.

**FIRST AID**
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- Keep victim calm and warm.
- Keep victim under observation.
- Effects of contact or inhalation may be delayed.
POTENTIAL HAZARDS

FIRE OR EXPLOSION
• Substance is transported in molten form at a temperature above 705°C (1300°F).
• Violent reaction with water; contact may cause an explosion or may produce a flammable gas.
• Will ignite combustible materials (wood, paper, oil, debris, etc.).
• Contact with nitrates or other oxidisers may cause an explosion.
• Contact with containers or other materials, including cold, wet or dirty tools, may cause an explosion.
• Contact with concrete will cause spalling and small pops.

HEALTH
• Contact causes severe burns to skin and eyes.
• Fire may produce irritating and/or toxic gases.

PUBLIC SAFETY
• CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
• As an immediate precautionary measure, isolate spill or leak area for at least 50 metres in all directions.
• Stay upwind, uphill and/or upstream.
• Keep unauthorized personnel away.
• Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
• Wear positive pressure self-contained breathing apparatus (SCBA).
• Wear flame-retardant structural firefighters’ protective clothing, including faceshield, helmet and gloves, as this will provide limited thermal protection.
## EMERGENCY RESPONSE

### FIRE
- Do Not Use Water, except in life-threatening situations and then only in a fine spray.
- Do not use halogenated extinguishing agents or foam.
- Move combustibles out of path of advancing pool if you can do so without risk.
- Extinguish fires started by molten material by using appropriate method for the burning material; keep water, halogenated extinguishing agents and foam away from the molten material.

### SPILL OR LEAK
- Do not touch or walk through spilled material.
- Do not attempt to stop leak, due to danger of explosion.
- Keep combustibles (wood, paper, oil, etc.) away from spilled material.
- Substance is very fluid, spreads quickly, and may splash. Do not try to stop it with shovels or other objects.
- Dike far ahead of spill; use dry sand to contain the flow of material.
- Where possible allow molten material to solidify naturally.
- Avoid contact even after material solidifies. Molten, heated and cold aluminum look alike; do not touch unless you know it is cold.
- Clean up under the supervision of an expert after material has solidified.

### FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- For severe burns, immediate medical attention is required.
- Removal of solidified molten material from skin requires medical assistance.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Keep victim calm and warm.
POTENTIAL HAZARDS

FIRE OR EXPLOSION
- May react violently or explosively on contact with water.
- Some are transported in flammable liquids.
- May be ignited by friction, heat, sparks or flames.
- Some of these materials will burn with intense heat.
- Dusts or fumes may form explosive mixtures in air.
- Containers may explode when heated.
- May re-ignite after fire is extinguished.

HEALTH
- Oxides from metallic fires are a severe health hazard.
- Inhalation or contact with substance or decomposition products may cause severe injury or death.
- Fire may produce irritating, corrosive and/or toxic gases.
- Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres for liquids and at least 25 metres for solids.
- Stay upwind, uphill and/or upstream.
- Keep unauthorized personnel away.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

EVACUATION

Large Spill
- Consider initial downwind evacuation for at least 50 metres.

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres in all directions; also, consider initial evacuation for 800 metres in all directions.
EMERGENCY RESPONSE

FIRE
- DO NOT USE WATER, FOAM OR CO₂.
- Dousing metallic fires with water will generate hydrogen gas, an extremely dangerous explosion hazard, particularly if fire is in a confined environment (i.e., building, cargo hold, etc.).
- Use DRY sand, graphite powder, dry sodium chloride-based extinguishers, G-1® or Met-L-X® powder.
- Confining and smothering metal fires is preferable rather than applying water.
- Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
- If impossible to extinguish, protect surroundings and allow fire to burn itself out.

SPILL OR LEAK
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Keep victim calm and warm.
POTENTIAL HAZARDS

FIRE OR EXPLOSION

- Some may burn but none ignite readily.
- Containers may explode when heated.
- Some may be transported hot.
- For UN3508, be aware of possible short circuiting as this product is transported in a charged state.
- Polymeric beads, expandable (UN2211) may evolve flammable vapours.

HEALTH

- Inhalation of material may be harmful.
- Contact may cause burns to skin and eyes.
- Inhalation of Asbestos dust may have a damaging effect on the lungs.
- Fire may produce irritating, corrosive and/or toxic gases.
- Some liquids produce vapours that may cause dizziness or suffocation.
- Runoff from fire control may cause pollution.

PUBLIC SAFETY

- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres for liquids and at least 25 metres for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

EVACUATION

Immediate precautionary measure

Spill

- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials.
  For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under “PUBLIC SAFETY”.

Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres in all directions; also, consider initial evacuation for 800 metres in all directions.
EMERGENCY RESPONSE

FIRE

Small Fire
• Dry chemical, CO₂, water spray or regular foam.

Large Fire
• Water spray, fog or regular foam.
• Do not scatter spilled material with high-pressure water streams.
• Move containers from fire area if you can do it without risk.
• Dike fire-control water for later disposal.

Fire involving Tanks
• Cool containers with flooding quantities of water until well after fire is out.
• Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
• ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
• Do not touch or walk through spilled material.
• Stop leak if you can do it without risk.
• Prevent dust cloud.
• Avoid inhalation of asbestos dust.

Small Dry Spill
• With clean shovel, place material into clean, dry container and cover loosely; move containers from spill area.

Small Spill
• Pick up with sand or other non-combustible absorbent material and place into containers for later disposal.

Large Spill
• Dike far ahead of liquid spill for later disposal.
• Cover powder spill with plastic sheet or tarp to minimize spreading.
• Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID
• Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
• Move victim to fresh air.
• Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
• Give artificial respiration if victim is not breathing.
• Administer oxygen if breathing is difficult.
• Remove and isolate contaminated clothing and shoes.
• In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
POTENTIAL HAZARDS

HEALTH
• Inhalation of vapours or contact with substance will result in contamination and potential harmful effects.
• Fire will produce irritating, corrosive and/or toxic gases.

FIRE OR EXPLOSION
• Non-combustible, substance itself does not burn but may react upon heating to produce corrosive and/or toxic fumes.
• Runoff may pollute waterways.

PUBLIC SAFETY
• CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
• As an immediate precautionary measure, isolate spill or leak area for at least 50 metres in all directions.
• Stay upwind, uphill and/or upstream.
• Keep unauthorized personnel away.

PROTECTIVE CLOTHING
• Wear positive pressure self-contained breathing apparatus (SCBA).
• Structural firefighters protective clothing will provide thermal protection but provides only limited chemical protection.

EVACUATION
Immediate precautionary measure
Large Spill
• Consider initial downwind evacuation for at least 100 metres.
Fire
• When any large container is involved in a fire, consider initial evacuation for 500 metres in all directions.
EMERGENCY RESPONSE

FIRE
- Use extinguishing agent suitable for type of surrounding fire.
- Do not direct water at the heated metal.

SPILL OR LEAK
- Do not touch or walk through spilled material.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.
- Do not use steel or aluminum tools or equipment.
- Cover with earth, sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.
- For mercury, use a mercury spill kit.
- Mercury spill areas may be subsequently treated with calcium sulphide/calcium sulfide or with sodium thiosulphate/sodium thiosulfate wash to neutralize any residual mercury.

FIRST AID
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Keep victim calm and warm.
POTENTIAL HAZARDS

HEALTH
- TOXIC; may be fatal if inhaled or absorbed through skin.
- Vapours may be irritating.
- Contact with gas may cause burns and injury.
- Fire will produce irritating, corrosive and/or toxic gases.
- Runoff from fire control may cause pollution.

FIRE OR EXPLOSION
- Some gases may burn or be ignited by heat, sparks or flames but NOT readily due to low transportation pressures.
- May form explosive mixtures with air.
- Oxidisers may ignite combustibles (wood, paper, oil, clothing, etc.) but NOT readily due to low transportation pressures.
- Vapours may travel to source of ignition and flash back.
- Some of these materials may react violently with water.
- Cylinders exposed to fire may vent and release toxic and flammable gas through pressure relief devices.
- Runoff may create fire hazard.

PUBLIC SAFETY
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 100 metres in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer when there is no risk of fire. It may provide little or no thermal protection.
- Structural firefighters’ protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION

Immediate precautionary measure
Spill
- See Table 1 - Initial Isolation and Protective Action Distances.

Fire
- If several small packages (rail or trailer) are involved in a fire, ISOLATE for 1600 metres in all directions; also, consider initial evacuation for 1600 metres in all directions.

*SOME SUBSTANCES MAY ALSO BE FLAMMABLE, CORROSIVE AND/OR OXIDISING*
EMERGENCY RESPONSE

FIRE
• DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.
  Small Fire
  • Dry chemical, CO₂, water spray or alcohol-resistant foam.
  • For UN3515, UN3518, UN3520, use water only; no dry chemical, CO₂ or Halon®.
  Large Fire
  • Water spray, fog or alcohol-resistant foam.
  • Do not get water inside containers.
  • Move containers from fire area if you can do it without risk.
  • Damaged cylinders should be handled only by specialists.

Fire involving Several Small Packages (rail or trailer)
• Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
• Cool containers with flooding quantities of water until well after fire is out.
• Do not direct water at source of leak or safety devices.
• Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
• ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
• Some gases may be flammable. ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area.
• For flammable gases, all equipment used when handling the product must be grounded.
• Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.
• For oxidising substances, keep combustibles (wood, paper, oil, etc.) away from spilled material.
• Do not touch or walk through spilled material.
• Stop leak if you can do it without risk.
• Do not direct water at spill or source of leak.
• Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
• Prevent entry into waterways, sewers, basements or confined areas.
• Isolate area until gas has dispersed.

FIRST AID
• Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
• Move victim to fresh air.
• Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
• Give artificial respiration if victim is not breathing.
• Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
• Administer oxygen if breathing is difficult.
• Remove and isolate contaminated clothing and shoes.
• In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
• In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
• Keep victim calm and warm.
• Keep victim under observation.
• Effects of contact or inhalation may be delayed.
**POTENTIAL HAZARDS**

**FIRE OR EXPLOSION**
- Some gases will be ignited by heat, sparks or flames but NOT readily due to low transportation pressure.
- Substance does not burn but will support combustion.
- Vapours may travel to source of ignition and flash back.
- Cylinders exposed to fire may vent and release flammable gas through pressure relief devices.
- Containers may explode when exposed to prolonged direct flame impingement.

**HEALTH**
- Vapours may cause dizziness or asphyxiation without warning.
- Some may be irritating if inhaled at high concentrations.
- Contact with gas may cause burns and injury.
- Fire may produce irritating and/or toxic gases.

**PUBLIC SAFETY**
- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area for at least 100 metres in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Ventilate closed spaces before entering.

**PROTECTIVE CLOTHING**
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters’ protective clothing will provide thermal protection but provides only limited chemical protection.

**EVACUATION**

**Immediate precautionary measure**

**Large Spill**
- Consider initial downwind evacuation for at least 800 metres.

**Fire**
- If several small packages (rail or trailer) are involved in a fire, ISOLATE for 1600 metres in all directions; also, consider initial evacuation for 1600 metres in all directions.
EMERGENCY RESPONSE

FIRE

- DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.
- Use extinguishing agent suitable for type of surrounding fire.

Small Fire
- Dry chemical or CO₂.

Large Fire
- Water spray or fog.
- Move containers from fire area if you can do it without risk.
- Damaged cylinders should be handled only by specialists.

Fire involving Several Small Packages (rail or trailer)
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices.
- Withdraw immediately in case of rising sound from venting safety devices or discolouration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

- For flammable gases, ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area.
- For oxidising substances, keep combustibles (wood, paper, oil, etc.) away from spilled material.
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Use water spray to reduce vapours or divert vapour cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.
- Prevent spreading of vapours through sewers, ventilation systems and confined areas.
- Ventilate the area.
- Isolate area until gas has dispersed.

FIRST AID

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 000 (Australia) or 111 (New Zealand) or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim calm and warm.
INTRODUCTION TO GREEN TABLES - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

Table 1 - Initial Isolation and Protective Action Distances suggests distances useful to protect people from vapours/gases resulting from spills involving:

- materials that are considered toxic by inhalation (TIH) (PIH in the US)
- materials that produce toxic gases upon contact with water
- chemical warfare agents

This table provides first responders with initial guidance until technically qualified emergency response personnel are available. For each material, first responders will find distances for the following zones:

- The **Initial Isolation Zone** defines an area surrounding the incident in which people may be exposed to dangerous (upwind) and life-threatening (downwind) concentrations of material.

- The **Protective Action Zone** defines an area downwind from the incident in which people may become incapacitated and unable to take protective action and/or incur serious or irreversible health effects. Table 1 provides specific guidance for small and large spills occurring day or night.

Adjusting distances for a specific incident involves many interdependent variables and should be made only by personnel technically qualified to make such adjustments. For this reason, no precise guidance can be provided in this document to aid in adjusting the table distances however, general guidance follows.

Factors That May Change the Protective Action Distances

**Fire**

In the orange-bordered pages, under Evacuation-Fire, the evacuation distance required to protect against fragmentation hazard of a large container. If the material becomes involved in a FIRE, the toxic hazard may be less than the fire or explosion hazard. In these cases, the Fire hazard distance should be used as an isolation distance and Table 1 should be used to protection downwind for residual material release.

**Worst-case scenario: terrorism, sabotage or catastrophic accident**

Initial isolation and protective action distances in this guidebook are derived from historical data on transportation incidents and the use of statistical models. For worst-case scenarios involving the instantaneous release of the entire contents of a package (e.g., as a result of terrorism, sabotage or catastrophic accident) the distances may increase substantially. For such events, doubling of the initial isolation and protective action distances is appropriate in absence of other information.
When more than one large package is leaking
If more than one tank car containing TIH materials involved in the incident is leaking, LARGE SPILL distances may need to be increased.

Other factors that can increase the protective action distance:
For a material with a protective action distance of 11.0 km (7.0 miles), the actual distance can be larger in certain atmospheric conditions. If the dangerous goods vapour plume is channeled in a valley or between many tall buildings, distances may be larger than shown in Table 1 due to less mixing of the plume with the atmosphere. Daytime spills in regions with known strong inversions or snow cover, or occurring near sunset, may require an increase of the protective action distance because airborne contaminants mix and disperse more slowly and may travel much farther downwind. In such cases, the nighttime protective action distance may be more appropriate. In addition, protective action distances may be larger for liquid spills when either the material or outdoor temperature exceeds 30 °C (86 °F).

Water-reactive materials
Materials that react with water to produce large amounts of toxic gases are included in Table 1 - Initial Isolation and Protective Action Distances. Some of these materials have 2 entries in Table 1. They are identified by (when spilled on land) since they are TIH products and (when spilled in water) because they produce additional toxic gases when spilled in water. Choose the larger protective action distance if: it is not clear whether the spill is on land or in water, the spill occurs both on land and in water.

Table 2  Water- Reactive Materials Which Produce Toxic Gases
This table lists materials that produce large amounts of Toxic Inhalation Hazard gases (TIH) when spilled in water as well as the toxic gases that are produced when spilled in water.
NOTE: The produced TIH gases indicated in Table 2 are for information purposes only. In Table 1, the initial isolation and protective action distances have already taken into consideration the produced TIH gas. When a water-reactive TIH-producing material is spilled into a river or stream, the source of the toxic gas may flow downstream for a great distance.

Table 3 lists Initial Isolation and Protective Action Distances for Toxic Inhalation Hazard materials that may be more commonly encountered.
This table lists materials that may be more commonly encountered. These materials are:

- UN1005- Ammonia, anhydrous
- UN1017-Chlorine
- UN1040-Ethylene oxide  and UN1040-Ethylene oxide with nitrogen
- UN1050-Hydrogen chloride, anhydrous (UN1050) and UN2186-Hydrogen chloride, refrigerated liquid
- UN1052-Hydrogen fluoride, anhydrous
- UN1079-Sulfur dioxide/Sulfur dioxide

This table provides Initial Isolation and Protective Action Distances for large spills (more than 208 litres or 55 US gallons) involving different container types (therefore different volume capacities) for day time and night time situations and for different wind speeds.
PROTECTIVE ACTION DECISION FACTORS TO CONSIDER

The choice of protective actions for a given situation depends on a number of factors. For some cases, evacuation may be the best option; in others, sheltering in-place may be the best course. Sometimes, these two actions may be used in combination. In any emergency, officials need to quickly give the public instructions. The public will need continuing information and instructions while being evacuated or sheltered in-place.

Proper evaluation of the factors listed below will determine the effectiveness of evacuation or in-place protection (shelter in-place). The importance of these factors can vary with emergency conditions. In specific emergencies, other factors may need to be identified and considered as well. This list indicates what kind of information may be needed to make the initial decision.

The Dangerous Goods

- Degree of health hazard
- Chemical and physical properties
- Amount involved
- Containment/control of release
- Rate of vapour movement

The Population Threatened

- Location
- Number of people
- Time available to evacuate or shelter in-place
- Ability to control evacuation or shelter in-place
- Building types and availability
- Special institutions or populations, e.g., nursing homes, hospitals, prisons

Weather Conditions

- Effect on vapour and cloud movement
- Potential for change
- Effect on evacuation or shelter in-place
PROTECTIVE ACTIONS

Protective Actions are those steps taken to preserve the health and safety of emergency responders and the public during an incident involving releases of dangerous goods. Table 1 - Initial Isolation and Protective Action Distances (green-bordered pages) predicts the size of downwind areas which could be affected by a cloud of toxic gas. People in this area should be evacuated and/or sheltered in-place inside buildings.

Isolate Hazard Area and Deny Entry means to keep everybody away from the area if they are not directly involved in emergency response operations. Unprotected emergency responders should not be allowed to enter the isolation zone. This “isolation” task is done first to establish control over the area of operations. This is the first step for any protective actions that may follow. See Table 1 - Initial Isolation and Protective Action Distances (green-bordered pages) for more detailed information on specific materials.

Evacuate means to move all people from a threatened area to a safer place. To perform an evacuation, there must be enough time for people to be warned, to get ready, and to leave an area. If there is enough time, evacuation is the best protective action. Begin evacuating people nearby and those outdoors in direct view of the scene. When additional help arrives, expand the area to be evacuated downwind and crosswind to at least the extent recommended in this guidebook. Even after people move to the distances recommended, they may not be completely safe from harm. They should not be permitted to congregate at such distances. Send evacuees to a definite place, by a specific route, far enough away so they will not have to be moved again if the wind shifts.

Shelter In-Place means people should seek shelter inside a building and remain inside until the danger passes. It is vital for first responders to maintain communications with sheltered-in-place people so that they are advised about changing conditions. Sheltering-in-place is used when either: evacuating the public would cause greater risk than staying where they are; an evacuation cannot be performed.

Direct the people inside to close all doors and windows and to shut off all ventilating, heating and cooling systems. Stay far from windows to avoid shattered gas and projectile metal fragments in the event of a fire and/or explosion. Tune in to local radio or TV station and stay inside until told it is safe to leave by first responders.

Shelter in-place may not be the best option if (a) the vapours are flammable (b) if it will take a long time for the gas to clear the area or (c) if buildings cannot be closed tightly. Vehicles can offer some protection for a short period if the windows are closed and the ventilating systems are shut off. Vehicles are not as effective as buildings for in-place protection.

Every dangerous goods incident is different. Each will have special problems and concerns. Action to protect the public must be selected carefully. These pages can help with initial decisions on how to protect the public. Officials must continue to gather information and monitor the situation until the threat is removed.
BACKGROUND ON TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

Initial Isolation and Protective Action Distances in this guidebook were determined for small and large spills occurring during day or night. The overall analysis was statistical in nature and was conducted using: state-of-the-art emission rate and dispersion models statistical release data from the U.S. DOT HMIS (Hazardous Materials Information System) database meteorological observations from over 120 locations in United States, Canada and Mexico and the most current toxicological exposure guidelines.

For each chemical, thousands of hypothetical releases were modeled to account for the statistical variation in both release amount and atmospheric conditions. Based on this statistical sample, the 90th percentile Protective Action Distance for each chemical and category was selected to appear in the Table. A brief description of the analysis is provided below. A detailed report outlining the methodology and data used in the generation of the Initial Isolation and Protective Action Distances may be obtained from the U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration.

DESCRIPTION OF THE ANALYSIS

Release amounts and emission rates into the atmosphere were statistically modeled based on (1) data from the U.S. DOT HMIS database (2) container types and sizes authorized for transport as specified in 49 CFR 172.101 and Part 173 (3) physical properties of the individual materials, and (4) atmospheric data from a historical database. For liquified gases, which can flash to form both a vapour/aerosol mixture and an evaporating pool, the emission mode calculated one or both of: the release of vapour due to evaporation of pools on the ground, direct release of vapours from the container. The emission model also calculated the emission of toxic vapour by-products generated from spilling water-reactive materials in water. Small spills involve 208 litres for liquids (55 US gallons) and 300 kg for solids (660 lbs). Large spills involve greater quantities. The exceptions are the entries at the beginning of Table 1 marked (when used as a weapon). The volumes used for these calculations varies, but in most cases: Small spills include releases up to 2 kg (4.4 lbs), and Large Spills include releases up to 25 kg (55 lbs). Downwind dispersion of the vapour was estimated for each case modeled. Using a database containing hourly meteorological data from 120 cities in the United States, Canada and Mexico the atmospheric parameters affecting the dispersion and the emission rate were selected. The dispersion calculation accounted for the time-dependent emission rate from the source and density of the vapour plume (i.e., heavy gas effects). Since atmospheric mixing is less effective at dispersing vapour plumes during nighttime, day and night were separated in the analysis. In the table Day refers to time periods after sunrise and before sunset, while Night includes all hours between sunset and sunrise.
Toxicological short-term exposure guidelines for the materials were applied to determine the downwind distance to which persons may become incapacitated and unable to take protective action or incur serious health effects after a single or rare, exposure. When available, toxicological exposure guidelines were chosen from AEGL-2 or ERPG-2 emergency response guidelines, with AEGL-2 values being the first choice. For materials without AEGL-2 or ERPG-2 values, emergency response guidelines were estimated from lethal concentration limits derived from animal studies. This approach was recommended by an independent panel of toxicological experts from industry and academia.
HOW TO USE TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

(1) The responder should already have:
   • Identified the material by its UN Number and Name; (if a UN Number cannot be found, use the Name of Material index in the blue-bordered pages to locate that number.)
   • confirmed that the material is highlighted in green in the yellow or blue-bordered pages. If not, Table 1 doesn't apply
   • Found the three-digit guide for that material in order to consult the emergency actions recommended jointly with this table;
   • Noted the wind direction.

(2) Look in Table 1 (the green-bordered pages) for the UN Number and Name of the Material involved in the incident. Some UN Numbers have more than one shipping name listed - look for the specific name of the material. (If the shipping name is not known and Table 1 lists more than one name for the same UN Number, use the entry with the largest protective action distances.)

(3) Determine if the incident involves a SMALL or LARGE spill and if DAY or NIGHT. A SMALL SPILL consists of a release of less than 208 litres. This generally corresponds to a spill from a single small package (e.g. a drum), a small cylinder, or a small leak from a large package. A LARGE SPILL consists of a release of more than 208 litres (55 US gallons). This usually involves a spill from a large package, or multiple spills from many small packages. DAY is any time after sunrise and before sunset. NIGHT is any time between sunset and sunrise.

(4) Look up the INITIAL ISOLATION DISTANCE. This distance defines the radius of a zone (Initial Isolation Zone) surrounding the spill in ALL DIRECTIONS. Within this zone, all public should be evacuated (protective clothing and respiratory protection is required in this zone). Persons should be directed to move out of the zone in a direction perpendicular to wind direction (crosswind), and away from the spill, to a minimum distance as prescribed by the Initial Isolation Distance.

(5) Look up the initial PROTECTIVE ACTION DISTANCE. For a given material, spill size, and whether day or night, Table 1 gives the downwind distance—in kilometres and miles—from the spill/leak source for which protective actions should be considered. For practical purposes, the Protective Action Zone (i.e., the area in which people are at risk of harmful exposure) is a square, whose length and width are the same as the downwind distance shown in Table 1. Protective actions are those steps taken to
preserve the health and safety of emergency responders and the public. People in this area should be evacuated and/or sheltered-in-place. Consult pages 288-290.

(6) Initiate Protective Actions beginning with those closest to the spill site and working away from the site in the downwind direction. When a water-reactive TIH (PIH in the US) producing material is spilled into a river or stream, the source of the toxic gas may move with the current or stretch from the spill point downstream for a large distance.

In the fire below, the spill is located at the centre of the small circle. The larger circle represents the INITIAL ISOLATION zone around the spill. The square (the protective action zone) is the area in which you should take protective actions.

NOTE 1: See “Introduction To Green Tables - Initial Isolation And Protective Action Distances” under “Factors That May Change the Protective Action Distances” (page 288)

NOTE 2: When a product in Table 1 has the mention “(when spilled in water)”, refer to Table 2 – Water-Reactive Materials for the list of gases produced when these materials are spilled in water. The TIH gases in Table 2 are for information purposes only.

Call the emergency response telephone number listed on the Transport Documents or the appropriate response agency as soon as possible for additional information on the material, safety precautions and mitigation procedures.
<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide</th>
<th>NAME OF MATERIAL</th>
<th>SMALL SPILLS</th>
<th>LARGE SPILLS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(From a small package or small leak from a large package)</td>
<td>First ISOLATE in all Directions</td>
<td>Then PROTECT persons Downwind during</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Metres (Feet)</td>
<td>Kilometres (Miles)</td>
<td>Kilometres (Miles)</td>
</tr>
<tr>
<td>1005</td>
<td>125</td>
<td>Ammonia, anhydrous</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1005</td>
<td>125</td>
<td>Anhydrous ammonia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1008</td>
<td>125</td>
<td>Boron trifluoride</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>1008</td>
<td>125</td>
<td>Boron trifluoride, compressed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1016</td>
<td>119</td>
<td>Carbon monoxide</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1016</td>
<td>119</td>
<td>Carbon monoxide, compressed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1017</td>
<td>124</td>
<td>Chlorine</td>
<td>60 m (200 ft)</td>
<td>0.3 km (0.2 mi)</td>
</tr>
<tr>
<td>1026</td>
<td>119</td>
<td>Cyanogen</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1040</td>
<td>119P</td>
<td>Ethylene oxide</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1040</td>
<td>119P</td>
<td>Ethylene oxide with Nitrogen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1045</td>
<td>124</td>
<td>Fluorine</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1045</td>
<td>124</td>
<td>Fluorine, compressed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1048</td>
<td>125</td>
<td>Hydrogen bromide, anhydrous</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1050</td>
<td>125</td>
<td>Hydrogen chloride, anhydrous</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1051</td>
<td>117</td>
<td>AC (when used as a weapon)</td>
<td>60 m (200 ft)</td>
<td>0.3 km (0.2 mi)</td>
</tr>
<tr>
<td>Code</td>
<td>Code</td>
<td>Description</td>
<td>Distance (m)</td>
<td>Distance (km)</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
<td>-------------</td>
<td>--------------</td>
<td>---------------</td>
</tr>
<tr>
<td>1051 117P</td>
<td>Hydrocyanic acid, aqueous solutions, with more than 20%</td>
<td>60 m (200 ft) 0.2 km (0.1 mi) 0.6 km (0.4 mi)</td>
<td>200 m (600 ft)</td>
<td>0.7 km (0.5 mi) 1.7 km (1.1 mi)</td>
</tr>
<tr>
<td>1051 117P</td>
<td>Hydrogen cyanide</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1051 117P</td>
<td>Hydrogen cyanide, anhydrous, stabilised</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1051 117P</td>
<td>Hydrogen cyanide, stabilised</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1052 125</td>
<td>Hydrogen fluoride, anhydrous</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.5 km (0.3 mi)</td>
<td></td>
<td>Refer to table 3</td>
</tr>
<tr>
<td>1053 117</td>
<td>Hydrogen sulphide</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.5 km (0.3 mi)</td>
<td>400 m (1250 ft)</td>
<td>2.2 km (1.4 mi) 6.3 km (3.9 mi)</td>
</tr>
<tr>
<td>1053 117</td>
<td>Hydrogen sulphide</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1061 118</td>
<td>Methylamine, anhydrous</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.2 km (0.1 mi)</td>
<td>200 m (600 ft)</td>
<td>0.7 km (0.4 mi) 2.1 km (1.3 mi)</td>
</tr>
<tr>
<td>1062 123</td>
<td>Methyl bromide</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.1 km (0.1 mi)</td>
<td>150 m (500 ft)</td>
<td>0.3 km (0.2 mi) 0.8 km (0.5 mi)</td>
</tr>
<tr>
<td>1064 117</td>
<td>Methyl mercaptan</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.3 km (0.2 mi)</td>
<td>200 m (600 ft)</td>
<td>1.3 km (0.8 mi) 4.1 km (2.6 mi)</td>
</tr>
<tr>
<td>1067 124</td>
<td>Dinitrogen tetroxide</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.4 km (0.3 mi)</td>
<td>400 m (1250 ft)</td>
<td>1.4 km (0.9 mi) 3.3 km (2.1 mi)</td>
</tr>
<tr>
<td>1067 124</td>
<td>Nitrogen dioxide</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1069 125</td>
<td>Nitrosyl chloride</td>
<td>30 m (100 ft) 0.2 km (0.2 mi) 1.0 km (0.6 mi)</td>
<td>800 m (2500 ft)</td>
<td>4.3 km (2.7 mi) 10.8 km (6.7 mi)</td>
</tr>
<tr>
<td>1076 125</td>
<td>CG (when used as a weapon)</td>
<td>150 m (500 ft) 0.8 km (0.5 mi) 3.2 km (2.0 mi)</td>
<td>1000 m (3000 ft)</td>
<td>7.5 km (4.7 mi) 11.0+ km (7.0+ mi)</td>
</tr>
<tr>
<td>1076 125</td>
<td>DP (when used as a weapon)</td>
<td>30 m (100 ft) 0.2 km (0.1 mi) 0.7 km (0.4 mi)</td>
<td>200 m (600 ft)</td>
<td>1.0 km (0.7 mi) 2.4 km (1.5 mi)</td>
</tr>
<tr>
<td>1076 125</td>
<td>Phosgene</td>
<td>100 m 300 ft 0.6 km (0.4 mi) 2.4 km (1.5 mi)</td>
<td>500 m (1500 ft)</td>
<td>2.9 km (1.8 mi) 9.2 km (5.7 mi)</td>
</tr>
<tr>
<td>1079 125</td>
<td>Sulfur dioxide</td>
<td>100 m (300 ft) 0.6 km (0.4 mi) 2.5 km (1.6 mi)</td>
<td></td>
<td>Refer to table 3</td>
</tr>
<tr>
<td>1082 119P</td>
<td>Refrigerant gas R-1113</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.1 km (0.1 mi)</td>
<td>60 m (200 ft)</td>
<td>0.4 km (0.2 mi) 0.8 km (0.5 mi)</td>
</tr>
<tr>
<td>1082 119P</td>
<td>Trifluorochloroethylene, stabilised</td>
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</tr>
</tbody>
</table>

"+" means distance can be larger in certain atmospheric conditions.
<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide</th>
<th>NAME OF MATERIAL</th>
<th>SMALL SPILLS</th>
<th>LARGE SPILLS</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>First ISOLATE in all Directions</td>
<td>Then PROTECT persons Downwind during</td>
<td>First ISOLATE in all Directions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Metres (Feet)</td>
<td>DAY Kilometres (Miles)</td>
<td>NIGHT Kilometres (Miles)</td>
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<tr>
<td>1092</td>
<td>131P</td>
<td>Acrolein, stabilised</td>
<td>100 m (300 ft) 1.2 km (0.8 mi) 3.3 km (2.1 mi)</td>
<td>500 m (1500 ft) 6.1 km (3.8 mi) 10.8 km (6.7 mi)</td>
</tr>
<tr>
<td>1093</td>
<td>131P</td>
<td>Acrylonitrile, stabilised</td>
<td>30 m (100 ft) 0.2 km (0.2 mi) 0.6 km (0.4 mi)</td>
<td>100 m (300 ft) 1.2 km (0.8 mi) 2.3 km (1.4 mi)</td>
</tr>
<tr>
<td>1098</td>
<td>131</td>
<td>Allyl alcohol</td>
<td>30 m (100 ft) 0.2 km (0.1 mi) 0.3 km (0.2 mi)</td>
<td>60 m (200 ft) 0.7 km (0.5 mi) 1.2 km (0.8 mi)</td>
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<td>1135</td>
<td>131</td>
<td>Ethylene chlorohydrin</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.1 km (0.1 mi)</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1143</td>
<td>131P</td>
<td>Crotonaldehyde</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.2 km (0.1 mi)</td>
<td>60 m (200 ft) 0.5 km (0.3 mi) 0.7 km (0.5 mi)</td>
</tr>
<tr>
<td>1143</td>
<td>131P</td>
<td>Crotonaldehyde, stabilised</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.2 km (0.2 mi)</td>
<td>60 m (200 ft) 0.6 km (0.4 mi) 1.8 km (1.1 mi)</td>
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<tr>
<td>1162</td>
<td>155</td>
<td>Dimethyl dichlorosilane (when spilled in water)</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.2 km (0.2 mi)</td>
<td>60 m (200 ft) 0.6 km (0.4 mi) 1.8 km (1.1 mi)</td>
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<td>1163</td>
<td>131</td>
<td>1,1-Dimethylhydrazine</td>
<td>30 m (100 ft) 0.2 km (0.1 mi) 0.5 km (0.3 mi)</td>
<td>100 m (300 ft) 1.0 km (0.6 mi) 1.8 km (1.1 mi)</td>
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<td>1163</td>
<td>131</td>
<td>Dimethylhydrazine, unsymmetrical</td>
<td>30 m (100 ft) 0.2 km (0.1 mi) 0.5 km (0.3 mi)</td>
<td>100 m (300 ft) 1.0 km (0.6 mi) 1.8 km (1.1 mi)</td>
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<td>1182</td>
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<td>Ethyl chloroformate</td>
<td>30 m (100 ft) 0.2 km (0.1 mi) 0.3 km (0.2 mi)</td>
<td>60 m (200 ft) 0.6 km (0.4 mi) 0.9 km (0.6 mi)</td>
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<tr>
<td>1183</td>
<td>139</td>
<td>Ethyl dichlorosilane (when spilled in water)</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.1 km (0.1 mi)</td>
<td>60 m (200 ft) 0.6 km (0.4 mi) 2.0 km (1.3 mi)</td>
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<tr>
<td>1185</td>
<td>131P</td>
<td>Ethyleneimine, stabilised</td>
<td>30 m (100 ft) 0.2 km (0.1 mi) 0.5 km (0.3 mi)</td>
<td>200 m (600 ft) 0.9 km (0.6 mi) 1.8 km (1.1 mi)</td>
</tr>
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<td>1196</td>
<td>155</td>
<td>Ethyltrichlorosilane (when spilled in water)</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.5 km (0.3 mi)</td>
<td>200 m (600 ft) 2.1 km (1.3 mi) 5.8 km (3.6 mi)</td>
</tr>
<tr>
<td>1238</td>
<td>155</td>
<td>Methyl chloroformate</td>
<td>30 m (100 ft) 0.2 km (0.2 mi) 0.5 km (0.4 mi)</td>
<td>150 m (500 ft) 1.1 km (0.7 mi) 2.1 km (1.3 mi)</td>
</tr>
<tr>
<td>1239</td>
<td>131</td>
<td>Methyl chloromethyl ether</td>
<td>60 m (200 ft) 0.5 km (0.3 mi) 1.5 km (0.9 mi)</td>
<td>300 m (1000 ft) 3.1 km (2.0 mi) 5.8 km (3.6 mi)</td>
</tr>
<tr>
<td>Code</td>
<td>Name</td>
<td>Distance Spilled In Water</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
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<tr>
<td>------</td>
<td>----------------------------------------------------------------------</td>
<td>----------------------------</td>
<td>-----------------</td>
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</tr>
<tr>
<td>1242</td>
<td>Methyl dichlorosilane (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1244</td>
<td>Methyl hydrazine</td>
<td>30 m (100 ft)</td>
<td>0.3 km (0.2 mi)</td>
<td>0.6 km (0.4 mi)</td>
</tr>
<tr>
<td>1250</td>
<td>Methyl trichlorosilane (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1251</td>
<td>Methyl vinyl ketone, stabilized</td>
<td>100 m (300 ft)</td>
<td>0.3 km (0.2 mi)</td>
<td>0.7 km (0.4 mi)</td>
</tr>
<tr>
<td>1259</td>
<td>Nickel carbonyl</td>
<td>100 m (300 ft)</td>
<td>1.3 km (0.8 mi)</td>
<td>5.0 km (3.1 mi)</td>
</tr>
<tr>
<td>1295</td>
<td>Trichlorosilane (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1298</td>
<td>Trimethyl chlorosilane (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1305</td>
<td>Vinyl trichlorosilane (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1305</td>
<td>Vinyl trichlorosilane, stabilized (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1340</td>
<td>Phosphorus pentasulfide, free from yellow and white Phosphorus (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1340</td>
<td>Phosphorus pentasulphide, free from yellow and white Phosphorus (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1360</td>
<td>Calcium phosphide (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.4 km (0.3 mi)</td>
</tr>
</tbody>
</table>

"+" means distance can be larger in certain atmospheric conditions.
### TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide</th>
<th>NAME OF MATERIAL</th>
<th>SMALL SPILLS</th>
<th>LARGE SPILLS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(From a small package or small leak from a large package)</td>
<td>(From a large package or from many small packages)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>First ISOLATE in all Directions</td>
<td>Then PROTECT persons Downwind during</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Metres (Feet)</td>
<td>DAY Kilometres (Miles)</td>
</tr>
<tr>
<td>1380</td>
<td>135</td>
<td>Pentaborane</td>
<td>60 m (200 ft)</td>
<td>0.6 km (0.4 mi)</td>
</tr>
<tr>
<td>1384</td>
<td>135</td>
<td>Sodium dithionite (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1384</td>
<td>135</td>
<td>Sodium hydrosulphite (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1384</td>
<td>135</td>
<td>Sodium hydrosulphite (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1390</td>
<td>139</td>
<td>Alkali metal amides (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1397</td>
<td>139</td>
<td>Aluminum phosphide (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1419</td>
<td>139</td>
<td>Magnesium aluminum phosphide (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1432</td>
<td>139</td>
<td>Sodium phosphide (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
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<tr>
<td>1510</td>
<td>143</td>
<td>Tetrachloromethane</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>1541</td>
<td>155</td>
<td>Acetone cyanohydrin, stabilised (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1556</td>
<td>152</td>
<td>MD (when used as a weapon)</td>
<td>300 m (1000 ft)</td>
<td>1.6 km (1.0 mi)</td>
</tr>
<tr>
<td>1556</td>
<td>152</td>
<td>Methyl dichloroarsine</td>
<td>100 m (300 ft)</td>
<td>1.4 km (0.9 mi)</td>
</tr>
<tr>
<td>1556</td>
<td>152</td>
<td>PD (when used as a weapon)</td>
<td>60 m (200 ft)</td>
<td>0.4 km (0.3 mi)</td>
</tr>
<tr>
<td>Code</td>
<td>Code</td>
<td>Description</td>
<td>Distance</td>
<td>Distance</td>
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<td>--------------------------------------------------</td>
<td>------------</td>
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<tr>
<td>1560</td>
<td>157</td>
<td>Arsenic chloride</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>1560</td>
<td>157</td>
<td>Arsenic trichloride</td>
<td>30 m (100 ft)</td>
<td>0.4 km (0.3 mi)</td>
</tr>
<tr>
<td>1569</td>
<td>131</td>
<td>Bromoacetone</td>
<td>30 m (100 ft)</td>
<td>0.5 km (0.3 mi)</td>
</tr>
<tr>
<td>1580</td>
<td>154</td>
<td>Chloropicrin</td>
<td>60 m (200 ft)</td>
<td>0.5 km (0.3 mi)</td>
</tr>
<tr>
<td>1581</td>
<td>123</td>
<td>Chloropicrin and Methyl bromide mixture</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
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<tr>
<td>1582</td>
<td>119</td>
<td>Chloropicrin and Methyl chloride mixture</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1583</td>
<td>119</td>
<td>Methyl chloride and Chloropicrin mixture</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
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<tr>
<td>1583</td>
<td>154</td>
<td>Chloropicrin mixture, n.o.s.</td>
<td>60 m (200 ft)</td>
<td>0.5 km (0.3 mi)</td>
</tr>
<tr>
<td>1589</td>
<td>125</td>
<td>CK (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.2 mi)</td>
</tr>
<tr>
<td>1589</td>
<td>125</td>
<td>Cyanogen chloride, stabilised</td>
<td>300 m (1000 ft)</td>
<td>1.8 km (1.2 mi)</td>
</tr>
<tr>
<td>1595</td>
<td>156</td>
<td>Dimethyl sulfate</td>
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<td>0.2 km (0.1 mi)</td>
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<tr>
<td>1605</td>
<td>154</td>
<td>Ethylene dibromide</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1612</td>
<td>123</td>
<td>Compressed gas and hexaethyl tetraphosphate mixture</td>
<td>100 m (300 ft)</td>
<td>0.8 km (0.5 mi)</td>
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</tbody>
</table>

"+" means distance can be larger in certain atmospheric conditions.
<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide</th>
<th>NAME OF MATERIAL</th>
<th>First ISOLATE in all Directions</th>
<th>Then PROTECT persons Downwind during</th>
<th>First ISOLATE in all Directions</th>
<th>Then PROTECT persons Downwind during</th>
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<tbody>
<tr>
<td></td>
<td></td>
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<td>Metres (Feet)</td>
<td>DAY Kilometres (Miles)</td>
<td>NIGHT Kilometres (Miles)</td>
<td>Metres (Feet)</td>
</tr>
<tr>
<td>1613</td>
<td>154</td>
<td>Hydrocyanic acid, aqueous solution, with not more than 20% Hydrogen cyanide</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>100 m (300 ft)</td>
</tr>
<tr>
<td>1613</td>
<td>154</td>
<td>Hydrogen cyanide, aqueous solution, with not more than 20% Hydrogen cyanide</td>
<td>60 m (200 ft)</td>
<td>0.2 km (0.1 mi)</td>
<td>0.6 km (0.4 mi)</td>
<td>150 m (500 ft)</td>
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<tr>
<td>1614</td>
<td>152</td>
<td>Hydrogen cyanide, stabilised (absorbed)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>150 m (500 ft)</td>
</tr>
<tr>
<td>1647</td>
<td>151</td>
<td>Ethylene dibromide and Methyl bromide mixture, liquid</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>150 m (500 ft)</td>
</tr>
<tr>
<td>1647</td>
<td>151</td>
<td>Methyl bromide and Ethylene dibromide mixture, liquid</td>
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<td>0.2 km (0.1 mi)</td>
<td>0.4 km (0.2 mi)</td>
<td>100 m (300 ft)</td>
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<tr>
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<td>124</td>
<td>Nitric oxide</td>
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<td>0.1 km (0.1 mi)</td>
<td>0.6 km (0.4 mi)</td>
<td>100 m (300 ft)</td>
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<tr>
<td>1660</td>
<td>124</td>
<td>Nitric oxide, compressed</td>
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<td>0.2 km (0.1 mi)</td>
<td>0.4 km (0.2 mi)</td>
<td>100 m (300 ft)</td>
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<td>157</td>
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<td>0.2 km (0.1 mi)</td>
<td>0.4 km (0.2 mi)</td>
<td>100 m (300 ft)</td>
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<tr>
<td>1672</td>
<td>151</td>
<td>Phenylcarbylamine chloride</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
<td>60 m (200 ft)</td>
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<tr>
<td>1680</td>
<td>157</td>
<td>Potassium cyanide (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>60 m (200 ft)</td>
</tr>
<tr>
<td>1680</td>
<td>157</td>
<td>Potassium cyanide, solid (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>60 m (200 ft)</td>
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<tr>
<td>1689</td>
<td>157</td>
<td>Sodium cyanide (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>100 m (300 ft)</td>
</tr>
<tr>
<td>1689</td>
<td>157</td>
<td>Sodium cyanide, solid (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>100 m (300 ft)</td>
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</tr>
<tr>
<td>1694</td>
<td>159</td>
<td>CA (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.4 km (0.3 mi)</td>
<td>100 m (300 ft)</td>
</tr>
<tr>
<td>1695</td>
<td>131</td>
<td>Chloroacetone, stabilised</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
<td>60 m (200 ft)</td>
</tr>
<tr>
<td>1697</td>
<td>153</td>
<td>CN (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
<td>60 m (200 ft)</td>
</tr>
<tr>
<td>1698</td>
<td>154</td>
<td>Adamsite (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.3 km (0.2 mi)</td>
<td>60 m (200 ft)</td>
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<tr>
<td>1699</td>
<td>151</td>
<td>DA (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
<td>0.8 km (0.5 mi)</td>
<td>300 m (1000 ft)</td>
</tr>
<tr>
<td>1716</td>
<td>156</td>
<td>Acetyl bromide (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>30 m (100 ft)</td>
</tr>
<tr>
<td>1717</td>
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<td>Acetyl chloride (when spilled in water)</td>
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<td>0.1 km (0.1 mi)</td>
<td>100 m (300 ft)</td>
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<tr>
<td>1722</td>
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<td>Allyl chlorocarbonate</td>
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<td>0.8 km (0.5 mi)</td>
<td>400 m (1250 ft)</td>
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<tr>
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<td>Allyl chloroformate</td>
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<td>400 m (1250 ft)</td>
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<tr>
<td>1724</td>
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<td>Allyltrichlorosilane, stabilised (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>60 m (200 ft)</td>
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<tr>
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<td>Aluminum bromide, anhydrous (when spilled in water)</td>
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<td>30 m (100 ft)</td>
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<td>Aluminum chloride, anhydrous (when spilled in water)</td>
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<td>60 m (200 ft)</td>
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<td>Amyltrichlorosilane (when spilled in water)</td>
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<td>0.1 km (0.1 mi)</td>
<td>60 m (200 ft)</td>
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<tr>
<td>1732</td>
<td>157</td>
<td>Antimony pentafluoride (when spilled in water)</td>
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<td>0.1 km (0.1 mi)</td>
<td>0.3 km (0.2 mi)</td>
<td>100 m (300 ft)</td>
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<td>1741</td>
<td>125</td>
<td>Boron trichloride (when spilled on land)</td>
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<td>0.3 km (0.2 mi)</td>
<td>100 m (300 ft)</td>
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<td>1741</td>
<td>125</td>
<td>Boron trichloride (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.3 km (0.2 mi)</td>
<td>100 m (300 ft)</td>
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"+" means distance can be larger in certain atmospheric conditions.
<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide</th>
<th>NAME OF MATERIAL</th>
<th>SMALL SPILLS</th>
<th>LARGE SPILLS</th>
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<tr>
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<td>(From a small package or small leak from a large package)</td>
<td>First ISOLATE in all Directions</td>
<td>Then PROTECT persons Downwind during</td>
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<tr>
<td></td>
<td></td>
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<td>Metres (Feet)</td>
<td>NIGHT Kilometres (Miles)</td>
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<tr>
<td>1744</td>
<td>154</td>
<td>Bromine</td>
<td>60 m (200 ft)</td>
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<td>1744</td>
<td>154</td>
<td>Bromine, solution</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
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<td></td>
<td></td>
<td>(Inhalation Hazard Zone A)</td>
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<tr>
<td>1745</td>
<td>144</td>
<td>Bromine pentafluoride (when spilled on land)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1745</td>
<td>144</td>
<td>Bromine pentafluoride (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
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<tr>
<td>1746</td>
<td>144</td>
<td>Bromine trifluoride (when spilled on land)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
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<td>1746</td>
<td>144</td>
<td>Bromine trifluoride (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>1747</td>
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<td>Butyltrichlorosilane (when spilled in water)</td>
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<tr>
<td>1749</td>
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<td>Chlorine trifluoride</td>
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<td>1752</td>
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<td>Chloroacetyl chloride (when spilled on land)</td>
<td>30 m (100 ft)</td>
<td>0.3 km (0.2 mi)</td>
</tr>
<tr>
<td>1752</td>
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<td>Chloroacetyl chloride (when spilled in water)</td>
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<td>Chlorophenyltrichlorosilane (when spilled in water)</td>
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<td>1754</td>
<td>137</td>
<td>Chlorosulfonic acid (with or without sulfur trioxide mixture) (when spilled on land)</td>
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<td>137</td>
<td>Chlorosulfonic acid (with or without sulfur trioxide mixture) (when spilled in water)</td>
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<td>1762</td>
<td>166</td>
<td>Cyclohexylchlorosilane (when spilled in water)</td>
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<td>1763</td>
<td>166</td>
<td>Dichlorophenyltrichlorosilane (when spilled in water)</td>
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<td>1765</td>
<td>166</td>
<td>Dichloroacetylene (when spilled in water)</td>
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<tr>
<td>1767</td>
<td>155</td>
<td>Diethylchlorosilane (when spilled in water)</td>
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</tr>
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</table>

IN AN EMERGENCY, IN AUSTRALIA CALL 000 | IN NEW ZEALAND CALL 111
<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide</th>
<th>NAME OF MATERIAL</th>
<th>First ISOLATE in all Directions (Metres/Feet)</th>
<th>Then PROTECT persons Downwind during DAY (Kilometres/Miles)</th>
<th>NIGHT (Kilometres/Miles)</th>
<th>First ISOLATE in all Directions (Metres/Feet)</th>
<th>Then PROTECT persons Downwind during DAY (Kilometres/Miles)</th>
<th>NIGHT (Kilometres/Miles)</th>
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<tbody>
<tr>
<td>1769</td>
<td>156</td>
<td>Diphenyldichlorosilane (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>30 m (100 ft)</td>
<td>0.3 km (0.2 mi)</td>
<td>1.1 km (0.7 mi)</td>
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<td>Dodecyltrichlorosilane (when spilled in water)</td>
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<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>30 m (200 ft)</td>
<td>0.4 km (0.3 mi)</td>
<td>1.2 km (0.8 mi)</td>
</tr>
<tr>
<td>1777</td>
<td>137</td>
<td>Fluorosulfonic acid (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
<td>0.5 km (0.3 mi)</td>
</tr>
<tr>
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<td>137</td>
<td>Fluorosulphonic acid (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>30 m (100 ft)</td>
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<td>Hexadecyltrichlorosilane (when spilled in water)</td>
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<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>30 m (100 ft)</td>
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<td>0.4 km (0.3 mi)</td>
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<td>0.1 km (0.1 mi)</td>
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<td>1.3 km (0.8 mi)</td>
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<td>Nonyltrichlorosilane (when spilled in water)</td>
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<td>1.4 km (0.9 mi)</td>
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<td>Octadecyltrichlorosilane (when spilled in water)</td>
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<td>0.1 km (0.1 mi)</td>
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<td>Phenyltrichlorosilane (when spilled in water)</td>
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<td>0.1 km (0.1 mi)</td>
<td>30 m (100 ft)</td>
<td>0.4 km (0.2 mi)</td>
<td>1.3 km (0.8 mi)</td>
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<td>1806</td>
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<td>Phosphorus pentachloride (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>30 m (100 ft)</td>
<td>0.3 km (0.2 mi)</td>
<td>1.3 km (0.8 mi)</td>
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<td>Distance Spilled In Water</td>
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<td>Phosphorus tribromide</td>
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<td>Phosphorus trichloride</td>
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<td>0.1 km (0.1 mi)</td>
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<td>Phosphorus oxychloride</td>
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<td>0.1 km (0.1 mi)</td>
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<td>Propionyl chloride</td>
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<td>Silicon tetrachloride</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
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<td>Sulfur chlorides</td>
<td>60 m (200 ft)</td>
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<td>Sulfur trioxide, stabilized</td>
<td>600 m (2000 ft)</td>
<td>2.9 km (1.8 mi)</td>
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<th><strong>LARGE SPILLS</strong> (From a large package or from many small packages)</th>
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<td><strong>First ISOLATE in all Directions</strong></td>
<td><strong>Then PROTECT persons Downwind during</strong></td>
</tr>
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<td></td>
<td></td>
<td>Metres (Feet)</td>
<td>DAY Kilometres (Miles)</td>
</tr>
<tr>
<td>1831</td>
<td>137</td>
<td>Sulfuric acid, fuming</td>
<td>60 m (200 ft)</td>
<td>0.4 km (0.2 mi)</td>
</tr>
<tr>
<td></td>
<td>137</td>
<td>Sulfuric acid, fuming, with not less than 30% free Sulfur trioxide</td>
<td>60 m (200 ft)</td>
<td>0.4 km (0.2 mi)</td>
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<tr>
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<td>137</td>
<td>Sulphuric acid, fuming</td>
<td>60 m (200 ft)</td>
<td>0.4 km (0.2 mi)</td>
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<td>137</td>
<td>Sulphuric acid, fuming, with not less than 30% free Sulphur trioxide</td>
<td>60 m (200 ft)</td>
<td>0.4 km (0.2 mi)</td>
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<tr>
<td>1834</td>
<td>137</td>
<td>Sulphuryl chloride (when spilled on land)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
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<td>1834</td>
<td>137</td>
<td>Sulphuryl chloride (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
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<tr>
<td>1834</td>
<td>137</td>
<td>Sulphuryl chloride (when spilled on land)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
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<tr>
<td>1834</td>
<td>137</td>
<td>Sulphuryl chloride (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>1836</td>
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<td>Thionyl chloride (when spilled on land)</td>
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<td>0.2 km (0.1 mi)</td>
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<td>1836</td>
<td>137</td>
<td>Thionyl chloride (when spilled in water)</td>
<td>100 m (300 ft)</td>
<td>0.9 km (0.6 mi)</td>
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<tr>
<td>1838</td>
<td>137</td>
<td>Titanium tetrachloride (when spilled on land)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>Year</td>
<td>No.</td>
<td>Chemical</td>
<td>Note</td>
<td>Distance</td>
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<tr>
<td>1838</td>
<td>137</td>
<td>Titanium tetrachloride</td>
<td>(when spilled in water)</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.1 km (0.1 mi) 60 m (200 ft) 0.5 km (0.3 mi) 1.7 km (1.0 mi)</td>
</tr>
<tr>
<td>1859</td>
<td>125</td>
<td>Silicon tetrafluoride</td>
<td></td>
<td>30 m (100 ft) 0.2 km (0.1 mi) 0.8 km (0.5 mi) 100 m (300 ft) 0.5 km (0.3 mi) 1.8 km (1.2 mi)</td>
</tr>
<tr>
<td>1892</td>
<td>151</td>
<td>ED</td>
<td>(when used as a weapon)</td>
<td>150 m (500 ft) 0.9 km (0.6 mi) 2.1 km (1.3 mi) 1000 m (3000 ft) 5.9 km (3.7 mi) 8.3 km (5.2 mi)</td>
</tr>
<tr>
<td>1892</td>
<td>151</td>
<td>Ethyldichloroarsine</td>
<td></td>
<td>150 m (500 ft) 1.5 km (0.9 mi) 2.1 km (1.3 mi) 400 m (1250 ft) 4.6 km (2.9 mi) 6.4 km (4.0 mi)</td>
</tr>
<tr>
<td>1898</td>
<td>156</td>
<td>Acetyl iodide</td>
<td>(when spilled in water)</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.1 km (0.1 mi) 30 m (100 ft) 0.4 km (0.3 mi) 1.1 km (0.7 mi)</td>
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<tr>
<td>1911</td>
<td>119</td>
<td>Diborane</td>
<td></td>
<td>60 m (200 ft) 0.3 km (0.2 mi) 1.2 km (0.7 mi) 300 m (1000 ft) 1.5 km (1.0 mi) 4.6 km (2.9 mi)</td>
</tr>
<tr>
<td>1923</td>
<td>135</td>
<td>Calcium dithionite</td>
<td>(when spilled in water)</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.4 km (0.3 mi) 60 m (200 ft) 0.7 km (0.4 mi) 2.6 km (1.6 mi)</td>
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<tr>
<td>1929</td>
<td>135</td>
<td>Potassium dithionite</td>
<td>(when spilled in water)</td>
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</tr>
<tr>
<td>1931</td>
<td>171</td>
<td>Zinc dithionite</td>
<td>(when spilled in water)</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.4 km (0.3 mi) (60 m) (200 ft) 0.6 km (0.4 mi) 2.4 km (1.5 mi)</td>
</tr>
</tbody>
</table>

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### TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

**SMALL SPILLS**
(From a small package or small leak from a large package)

<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide</th>
<th>NAME OF MATERIAL</th>
<th>First ISOLATE in all Directions</th>
<th>Then PROTECT persons Downwind during</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Metres (Feet)</td>
<td>DAY Kilometres (Miles)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NIGHT Kilometres (Miles)</td>
</tr>
<tr>
<td>1953</td>
<td>119</td>
<td>Compressed gas, poisonous, flammable, n.o.s. (Inhalation Hazard Zone A)</td>
<td>150 m (500 ft)</td>
<td>1.0 km (0.6 mi) 3.8 km (2.4 mi)</td>
</tr>
<tr>
<td>1953</td>
<td>119</td>
<td>Compressed gas, poisonous, flammable, n.o.s. (Inhalation Hazard Zone B)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi) 0.4 km (0.2 mi)</td>
</tr>
<tr>
<td>1953</td>
<td>119</td>
<td>Compressed gas, poisonous, flammable, n.o.s. (Inhalation Hazard Zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi) 0.3 km (0.2 mi)</td>
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<tr>
<td>1953</td>
<td>119</td>
<td>Compressed gas, poisonous, flammable, n.o.s. (Inhalation Hazard Zone D)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi) 0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>1953</td>
<td>119</td>
<td>Compressed gas, toxic, flammable, n.o.s. (Inhalation Hazard Zone A)</td>
<td>150 m (500 ft)</td>
<td>1.0 km (0.6 mi) 3.8 km (2.4 mi)</td>
</tr>
<tr>
<td>1953</td>
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<td>Compressed gas, toxic, flammable, n.o.s. (Inhalation Hazard Zone B)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi) 0.4 km (0.2 mi)</td>
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<tr>
<td>1953</td>
<td>119</td>
<td>Compressed gas, toxic, flammable, n.o.s. (Inhalation Hazard Zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi) 0.3 km (0.2 mi)</td>
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**LARGE SPILLS**
(From a large package or from many small packages)

<table>
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<tr>
<th>UN No.</th>
<th>Guide</th>
<th>NAME OF MATERIAL</th>
<th>First ISOLATE in all Directions</th>
<th>Then PROTECT persons Downwind during</th>
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<tbody>
<tr>
<td></td>
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<td></td>
<td>Metres (Feet)</td>
<td>DAY Kilometres (Miles)</td>
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<td></td>
<td></td>
<td>NIGHT Kilometres (Miles)</td>
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<td>1953</td>
<td>119</td>
<td>Compressed gas, poisonous, flammable, n.o.s. (Inhalation Hazard Zone A)</td>
<td>1000 m (3000 ft)</td>
<td>5.7 km (3.6 mi) 10.1 km (6.3 mi)</td>
</tr>
<tr>
<td>1953</td>
<td>119</td>
<td>Compressed gas, poisonous, flammable, n.o.s. (Inhalation Hazard Zone B)</td>
<td>300 m (1000 ft)</td>
<td>1.3 km (0.8 mi) 3.4 km (2.1 mi)</td>
</tr>
<tr>
<td>1953</td>
<td>119</td>
<td>Compressed gas, poisonous, flammable, n.o.s. (Inhalation Hazard Zone C)</td>
<td>150 m (500 ft)</td>
<td>1.0 km (0.6 mi) 2.9 km (1.8 mi)</td>
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<td>119</td>
<td>Compressed gas, poisonous, flammable, n.o.s. (Inhalation Hazard Zone D)</td>
<td>150 m (500 ft)</td>
<td>0.8 km (0.5 mi) 2.0 km (1.3 mi)</td>
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<td>Compressed gas, toxic, flammable, n.o.s. (Inhalation Hazard Zone A)</td>
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<td>5.7 km (3.6 mi) 10.1 km (6.3 mi)</td>
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<tr>
<td>Year</td>
<td>Number</td>
<td>Description</td>
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<td>119</td>
<td>Compressed gas, toxic, flammable, n.o.s. (Inhalation Hazard Zone D)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
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<td>30 m (100 ft)</td>
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<td><strong>Then PROTECT persons Downwind during</strong></td>
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<td>1955</td>
<td>123</td>
<td>Organic phosphate compound mixed with compressed gas</td>
<td>100 m (300 ft)</td>
<td>1.0 <strong>km</strong> (0.7 <strong>mi</strong>)</td>
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<td>1955</td>
<td>123</td>
<td>Organic phosphate mixed with compressed gas</td>
<td>100 m (300 ft)</td>
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<td>1955</td>
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<td>Organic phosphorus compound mixed with compressed gas</td>
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<td>1967</td>
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<td>Insecticide gas, poisonous, n.o.s.</td>
<td>100 m (300 ft)</td>
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<td>Parathion and compressed gas mixture</td>
<td>100 m (300 ft)</td>
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<td>1975</td>
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<td>Dinitrogen tetroxide and Nitric oxide mixture</td>
<td>30 m (100 ft)</td>
<td>0.1 <strong>km</strong> (0.1 <strong>mi</strong>)</td>
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<td>1975</td>
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<td>Nitric oxide and Dinitrogen tetroxide mixture</td>
<td>30 m (100 ft)</td>
<td>0.1 <strong>km</strong> (0.1 <strong>mi</strong>)</td>
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<td>1975</td>
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<td>Nitric oxide and Nitrogen dioxide mixture</td>
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<td>Nitrogen tetroxide and Nitric oxide mixture</td>
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<td>1994</td>
<td>136</td>
<td>Iron pentacarbonyl</td>
<td>100 m (300 ft)</td>
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<td>Year</td>
<td>Number</td>
<td>Substance</td>
<td>Distance in Water (m / ft)</td>
<td>Distance in Air (km / mi)</td>
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<td>135</td>
<td>Magnesium diamide (when spilled in water)</td>
<td>30 m (100 ft)</td>
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<td>0.3 km (0.2 mi)</td>
<td>60 m (200 ft)</td>
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<td>0.6 km (0.4 mi)</td>
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<tr>
<td>2011</td>
<td>139</td>
<td>Magnesium phosphide (when spilled in water)</td>
<td>30 m (100 ft)</td>
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<td>0.6 km (0.4 mi)</td>
<td>500 m (1500 ft)</td>
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<td>1.7 km (1.1 mi)</td>
<td>5.4 km (3.4 mi)</td>
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<tr>
<td>2012</td>
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<td>Potassium phosphide (when spilled in water)</td>
<td>30 m (100 ft)</td>
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<td>0.6 km (0.4 mi)</td>
<td>300 m (1000 ft)</td>
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<td>1.1 km (0.7 mi)</td>
<td>3.6 km (2.2 mi)</td>
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<td>2013</td>
<td>139</td>
<td>Strontium phosphide (when spilled in water)</td>
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<td>0.6 km (0.4 mi)</td>
<td>300 m (1000 ft)</td>
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<td>2032</td>
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<td>Nitric acid, red fuming (when spilled in water)</td>
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<td>0.6 km (0.4 mi)</td>
<td>150 m (500 ft)</td>
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<td>0.3 km (0.2 mi)</td>
<td>0.5 km (0.3 mi)</td>
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<tr>
<td>2186</td>
<td>125</td>
<td>Hydrogen chloride, refrigerated liquid (when spilled in water)</td>
<td>30 m (100 ft)</td>
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<td>0.6 km (0.4 mi)</td>
<td>Refer to table 3</td>
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<td>2.2 km (1.4 mi)</td>
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<tr>
<td>2188</td>
<td>119</td>
<td>Arsine (when used as a weapon)</td>
<td>150 m (500 ft)</td>
<td>1.0 km (0.6 mi)</td>
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<td>3.8 km (2.4 mi)</td>
<td>1000 m (3000 ft)</td>
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<td>5.7 km (3.6 mi)</td>
<td>10.1 km (6.3 mi)</td>
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<tr>
<td>2188</td>
<td>119</td>
<td>SA (when used as a weapon)</td>
<td>300 m (1000 ft)</td>
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<td>8.9 km (5.6 mi)</td>
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<td>0.4 km (0.2 mi)</td>
<td>300 m (1000 ft)</td>
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<td>3.4 km (2.1 mi)</td>
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<td>124</td>
<td>Oxygen difluoride</td>
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<td>124</td>
<td>Oxygen difluoride, compressed</td>
<td>300 m (1000 ft)</td>
<td>1.8 km (1.1 mi)</td>
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<td>7.1 km (4.4 mi)</td>
<td>1000 m (3000 ft)</td>
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<td>11.0 km (7.0 mi)</td>
<td>11.0+ km (7.0+ mi)</td>
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<td>Sulfuryl fluoride</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
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<td>3.3 km (2.1 mi)</td>
<td>500 m (1500 ft)</td>
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<td>3.3 km (2.1 mi)</td>
<td>7.5 km (4.7 mi)</td>
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<td>0.8 km (0.5 mi)</td>
<td>2.7 km (1.7 mi)</td>
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<td>2197</td>
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<td>Hydrogen iodide, anhydrous</td>
<td>30 m (100 ft)</td>
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<td>Phosphorus pentfluoride</td>
<td>30 m (100 ft)</td>
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<td>2198</td>
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<td>3.5 km (2.2 mi)</td>
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"+" means distance can be larger in certain atmospheric conditions.
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<th>LARGE SPILLS</th>
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<td>Metres (Feet)</td>
<td>DAY Kilometres (Miles)</td>
</tr>
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<td>2199</td>
<td>119</td>
<td>Phosphine</td>
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<td>2204</td>
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<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2204</td>
<td>119</td>
<td>Carbonyl sulphide</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2232</td>
<td>153</td>
<td>Chloroacetaldehyde</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>2232</td>
<td>153</td>
<td>2-Chloroethanal</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>2285</td>
<td>156</td>
<td>Isocyanatobenzotrifluorides</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2308</td>
<td>157</td>
<td>Nitrosylsulfuric acid, liquid (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2308</td>
<td>157</td>
<td>Nitrosylsulfuric acid, solid (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2308</td>
<td>157</td>
<td>Nitrosylsulphuric acid, liquid (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2308</td>
<td>157</td>
<td>Nitrosylsulphuric acid, solid (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2334</td>
<td>131</td>
<td>Allylamine</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>2337</td>
<td>131</td>
<td>Phenyl mercaptan</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2353</td>
<td>132</td>
<td>Butyryl chloride (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2382</td>
<td>131</td>
<td>Dimethylhydrazine, symmetrical</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>Compounds</td>
<td>Distance &amp; Dilution</td>
<td></td>
<td></td>
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<tr>
<td>---------------------------------------------</td>
<td>---------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Isobutyryl chloride</strong>&lt;br&gt; (when spilled in water)</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.1 km (0.1 mi) 30 m (100 ft) 0.2 km (0.1 mi) 0.4 km (0.3 mi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Isopropyl chloroformate</strong></td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.2 km (0.2 mi) 60 m (200 ft) 0.5 km (0.3 mi) 0.9 km (0.6 mi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Carbonyl fluoride</strong></td>
<td>150 m (500 ft) 0.7 km (0.5 mi) 2.5 km (1.6 mi) 600 m (2000 ft) 3.6 km (2.3 mi) 7.8 km (4.9 mi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sulfur tetrafluoride</strong></td>
<td>100 m (300 ft) 0.5 km (0.3 mi) 2.3 km (1.5 mi) 400 m (1250 ft) 2.1 km (1.3 mi) 6.0 km (3.7 mi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hexafluoroacetone</strong></td>
<td>100 m (300 ft) 0.7 km (0.4 mi) 2.7 km (1.7 mi) 1000 m (3000 ft) 11.0+ km (7.0+ mi) 11.0+ km (7.0+ mi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Nitrogen trioxide</strong></td>
<td>60 m (200 ft) 0.3 km (0.2 mi) 1.2 km (0.7 mi) 200 m (600 ft) 1.2 km (0.8 mi) 4.2 km (2.6 mi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dibenzylchlorosilane</strong>&lt;br&gt; (when spilled in water)</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.1 km (0.1 mi) 30 m (100 ft) 0.1 km (0.1 mi) 0.4 km (0.3 mi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ethylphenyldichlorosilane</strong>&lt;br&gt; (when spilled in water)</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.1 km (0.1 mi) 30 m (100 ft) 0.3 km (0.2 mi) 0.9 km (0.6 mi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Methylphenyldichlorosilane</strong>&lt;br&gt; (when spilled in water)</td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.1 km (0.1 mi) 30 m (100 ft) 0.4 km (0.2 mi) 1.2 km (0.8 mi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Trimethylacetyl chloride</strong></td>
<td>60 m (200 ft) 0.5 km (0.3 mi) 1.0 km (0.6 mi) 200 m (600 ft) 2.1 km (1.3 mi) 3.3 km (2.1 mi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Trichloroacetyl chloride</strong></td>
<td>30 m (100 ft) 0.2 km (0.1 mi) 0.3 km (0.2 mi) 60 m (200 ft) 0.7 km (0.4 mi) 1.1 km (0.7 mi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Thiophosgene</strong></td>
<td>60 m (200 ft) 0.6 km (0.4 mi) 1.7 km (1.1 mi) 200 m (600 ft) 2.1 km (1.3 mi) 4.0 km (2.5 mi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Methyl isothiocyanate</strong></td>
<td>30 m (100 ft) 0.1 km (0.1 mi) 0.1 km (0.1 mi) 30 m (100 ft) 0.3 km (0.2 mi) 0.4 km (0.3 mi)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

"+" means distance can be larger in certain atmospheric conditions.
**TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES**

<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide</th>
<th>NAME OF MATERIAL</th>
<th>SMALL SPILLS</th>
<th>LARGE SPILLS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(From a small package or small leak from a large package)</td>
<td>(From a large package or from many small packages)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>First ISOLATE in all Directions</td>
<td>Then PROTECT persons Downwind during</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Metres (Feet)</td>
<td>DAY Kilometres (Miles)</td>
</tr>
<tr>
<td>2478</td>
<td>155</td>
<td>Isocyanate solution, flammable, poisonous, n.o.s.</td>
<td>60 m (200 ft)</td>
<td>0.8 km (0.5 mi)</td>
</tr>
<tr>
<td>2480</td>
<td>155P</td>
<td>Methyl isocyanate</td>
<td>150 m (500 ft)</td>
<td>1.7 km (1.1 mi)</td>
</tr>
<tr>
<td>2481</td>
<td>155</td>
<td>Ethyl isocyanate</td>
<td>150 m (500 ft)</td>
<td>2.0 km (1.2 mi)</td>
</tr>
<tr>
<td>2482</td>
<td>155P</td>
<td>n-Propyl isocyanate</td>
<td>100 m (300 ft)</td>
<td>1.3 km (0.8 mi)</td>
</tr>
<tr>
<td>2483</td>
<td>155P</td>
<td>Isopropyl isocyanate</td>
<td>150 m (500 ft)</td>
<td>1.5 km (0.9 mi)</td>
</tr>
<tr>
<td>2484</td>
<td>155</td>
<td>tert-Butyl isocyanate</td>
<td>60 m (200 ft)</td>
<td>0.8 km (0.5 mi)</td>
</tr>
<tr>
<td>2485</td>
<td>155P</td>
<td>n-Butyl isocyanate</td>
<td>60 m (200 ft)</td>
<td>0.6 km (0.4 mi)</td>
</tr>
<tr>
<td>2486</td>
<td>155P</td>
<td>Isobutyl isocyanate</td>
<td>60 m (200 ft)</td>
<td>0.6 km (0.4 mi)</td>
</tr>
<tr>
<td>2487</td>
<td>155</td>
<td>Phenyl isocyanate</td>
<td>100 m (300 ft)</td>
<td>0.9 km (0.6 mi)</td>
</tr>
<tr>
<td>2488</td>
<td>155</td>
<td>Cyclohexyl isocyanate</td>
<td>30 m (100 ft)</td>
<td>0.3 km (0.2 mi)</td>
</tr>
<tr>
<td>2495</td>
<td>144</td>
<td>Iodine pentfluoride (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2521</td>
<td>131P</td>
<td>Diketene, stabilized</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>2534</td>
<td>119</td>
<td>Methylchlorosilane</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>Code</td>
<td>Name</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------------------------</td>
<td>---------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>2548</td>
<td>Chlorine pentafluoride</td>
<td>100 m (300 ft)</td>
<td>0.5 km (0.3 mi)</td>
<td>2.5 km (1.6 mi)</td>
</tr>
<tr>
<td>2605</td>
<td>Methoxymethyl isocyanate</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>2606</td>
<td>Methyl orthosilicate</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
<td>0.3 km (0.2 mi)</td>
</tr>
<tr>
<td>2644</td>
<td>Methyl iodide</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>2646</td>
<td>Hexachlorocyclopentadiene</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2668</td>
<td>Chloroacetonitrile</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2676</td>
<td>Stibine</td>
<td>60 m (200 ft)</td>
<td>0.3 km (0.2 mi)</td>
<td>1.6 km (1.0 mi)</td>
</tr>
<tr>
<td>2691</td>
<td>Phosphorus pentabromide</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2692</td>
<td>Boron tribromide (when spilled on land)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>2692</td>
<td>Boron tribromide (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>2740</td>
<td>n-Propyl chloroformate</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.3 km (0.2 mi)</td>
</tr>
<tr>
<td>2742</td>
<td>sec-Butyl chloroformate</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>2742</td>
<td>Chloroformates, poisonous, corrosive, flammable, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>2742</td>
<td>Chloroformates, toxic, corrosive, flammable, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2743</td>
<td>Isobutyl chloroformate</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2743</td>
<td>n-Butyl chloroformate</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
</tbody>
</table>

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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>First ISOLATE in all Directions</td>
<td>Then PROTECT persons Downwind during</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Metres (Feet)</td>
<td>Kilometres (Miles)</td>
</tr>
<tr>
<td>2806</td>
<td>139</td>
<td>Lithium nitride (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2810</td>
<td>153</td>
<td>Buzz (when used as a weapon)</td>
<td>60 m (200 ft)</td>
<td>0.4 km (0.2 mi)</td>
</tr>
<tr>
<td>2810</td>
<td>153</td>
<td>CS (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2810</td>
<td>153</td>
<td>DC (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2810</td>
<td>153</td>
<td>GA (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>2810</td>
<td>153</td>
<td>GB (when used as a weapon)</td>
<td>60 m (200 ft)</td>
<td>0.4 km (0.2 mi)</td>
</tr>
<tr>
<td>2810</td>
<td>153</td>
<td>GD (when used as a weapon)</td>
<td>60 m (200 ft)</td>
<td>0.4 km (0.2 mi)</td>
</tr>
<tr>
<td>2810</td>
<td>153</td>
<td>GF (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.2 mi)</td>
</tr>
<tr>
<td>2810</td>
<td>153</td>
<td>H (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2810</td>
<td>153</td>
<td>HD (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2810</td>
<td>153</td>
<td>HN-1 (when used as a weapon)</td>
<td>60 m (200 ft)</td>
<td>0.3 km (0.2 mi)</td>
</tr>
<tr>
<td>2810</td>
<td>153</td>
<td>HN-2 (when used as a weapon)</td>
<td>60 m (200 ft)</td>
<td>0.3 km (0.2 mi)</td>
</tr>
<tr>
<td>2810</td>
<td>153</td>
<td>HN-3 (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>Code</td>
<td>153</td>
<td>Compound</td>
<td>Distance (in meters)</td>
<td>Distance (in kilometers)</td>
</tr>
<tr>
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<td>-----------------------------------</td>
<td>----------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>2810</td>
<td></td>
<td>L (Lewisite) (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2810</td>
<td></td>
<td>Lewisite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2810</td>
<td></td>
<td>Mustard (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2810</td>
<td></td>
<td>Mustard Lewisite (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2810</td>
<td></td>
<td>Sarin (when used as a weapon)</td>
<td>60 m (200 ft)</td>
<td>0.4 km (0.3 mi)</td>
</tr>
<tr>
<td>2810</td>
<td></td>
<td>Soman (when used as a weapon)</td>
<td>60 m (200 ft)</td>
<td>0.4 km (0.3 mi)</td>
</tr>
<tr>
<td>2810</td>
<td></td>
<td>Tabun (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>2810</td>
<td></td>
<td>Thickened GD (when used as a weapon)</td>
<td>60 m (200 ft)</td>
<td>0.4 km (0.3 mi)</td>
</tr>
<tr>
<td>2810</td>
<td></td>
<td>VX (when used as a weapon)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2811</td>
<td></td>
<td>CX (when used as a weapon)</td>
<td>60 m (200 ft)</td>
<td>0.2 km (0.2 mi)</td>
</tr>
<tr>
<td>2826</td>
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<td>Ethyl chlorothioformate</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>2845</td>
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<td>Ethyl phosphonous dichloride, anhydrous</td>
<td>30 m (100 ft)</td>
<td>0.3 km (0.2 mi)</td>
</tr>
<tr>
<td>2845</td>
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<td>Ethyl phosphonous dichloride</td>
<td>30 m (100 ft)</td>
<td>0.4 km (0.3 mi)</td>
</tr>
<tr>
<td>2901</td>
<td></td>
<td>Bromine chloride</td>
<td>100 m (300 ft)</td>
<td>0.5 km (0.3 mi)</td>
</tr>
<tr>
<td>2927</td>
<td></td>
<td>Ethyl phosphonothioic dichloride, anhydrous</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2927</td>
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<td>Ethyl phosphorodichloride</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2965</td>
<td></td>
<td>Boron trifluoride dimethyl etherate (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
</tbody>
</table>

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<td>Then PROTECT persons Downwind during</td>
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<td>Metres (Feet)</td>
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</tr>
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<tr>
<td>2977</td>
<td>166</td>
<td>Radioactive material, Uranium hexafluoride, fissile (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2977</td>
<td>166</td>
<td>Uranium hexafluoride, radioactive material, fissile (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2978</td>
<td>166</td>
<td>Radioactive material, Uranium hexafluoride, non fissile or fissile-excepted (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2978</td>
<td>166</td>
<td>Uranium hexafluoride, radioactive material, non fissile or fissile-excepted (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2985</td>
<td>155</td>
<td>Chlorosilanes, flammable, corrosive, n.o.s. (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2986</td>
<td>155</td>
<td>Chlorosilanes, corrosive, flammable, n.o.s. (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2987</td>
<td>156</td>
<td>Chlorosilanes, corrosive, n.o.s. (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>2988</td>
<td>139</td>
<td>Chlorosilanes, water-reactive, flammable, corrosive, n.o.s. (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------------------------------------------------------</td>
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<td>-----------------</td>
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</tr>
<tr>
<td>3023</td>
<td>2-Methyl-2-heptanethiol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3048</td>
<td>Aluminum phosphide pesticide (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>3057</td>
<td>Trifluoroacetyl chloride</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>3079</td>
<td>Methacrylonitrile, stabilized</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>3083</td>
<td>Perchloryl fluoride</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>3160</td>
<td>Liquefied gas, poisonous, flammable, n.o.s. (Inhalation Hazard Zone A)</td>
<td>150 m (500 ft)</td>
<td>1.0 km (0.6 mi)</td>
<td>3.8 km (2.4 mi)</td>
</tr>
<tr>
<td>3160</td>
<td>Liquefied gas, poisonous, flammable, n.o.s. (Inhalation Hazard Zone B)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.4 km (0.2 mi)</td>
</tr>
<tr>
<td>3160</td>
<td>Liquefied gas, poisonous, flammable, n.o.s. (Inhalation Hazard Zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.3 km (0.2 mi)</td>
</tr>
<tr>
<td>3160</td>
<td>Liquefied gas, poisonous, flammable, n.o.s. (Inhalation Hazard Zone D)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
</tbody>
</table>

"+" means distance can be larger in certain atmospheric conditions.
<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide</th>
<th>NAME OF MATERIAL</th>
<th>First ISOLATE in all Directions</th>
<th>Then PROTECT persons Downwind during</th>
<th>DAY Kilometres (Miles)</th>
<th>NIGHT Kilometres (Miles)</th>
<th>First ISOLATE in all Directions</th>
<th>Then PROTECT persons Downwind during</th>
<th>DAY Kilometres (Miles)</th>
<th>NIGHT Kilometres (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3160</td>
<td>119</td>
<td>Liquefied gas, toxic, flammable, n.o.s.</td>
<td>150 m (500 ft)</td>
<td>1.0 km (0.6 mi)</td>
<td>3.8 km (2.4 mi)</td>
<td>1000 m (3000 ft)</td>
<td>5.7 km (3.6 mi)</td>
<td>10.1 km (6.3 mi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3160</td>
<td>119</td>
<td>Liquefied gas, toxic, flammable, n.o.s. (Inhalation Hazard Zone A)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.4 km (0.2 mi)</td>
<td>300 m (1000 ft)</td>
<td>1.3 km (0.8 mi)</td>
<td>3.4 km (2.1 mi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3160</td>
<td>119</td>
<td>Liquefied gas, toxic, flammable, n.o.s. (Inhalation Hazard Zone B)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.3 km (0.2 mi)</td>
<td>150 m (500 ft)</td>
<td>1.0 km (0.6 mi)</td>
<td>2.9 km (1.8 mi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3160</td>
<td>119</td>
<td>Liquefied gas, toxic, flammable, n.o.s. (Inhalation Hazard Zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
<td>150 m (500 ft)</td>
<td>0.8 km (0.5 mi)</td>
<td>2.0 km (1.3 mi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3162</td>
<td>123</td>
<td>Liquefied gas, poisonous, n.o.s. (Inhalation Hazard Zone A)</td>
<td>100 m (300 ft)</td>
<td>0.5 km (0.3 mi)</td>
<td>2.5 km (1.6 mi)</td>
<td>1000 m (3000 ft)</td>
<td>5.7 km (3.6 mi)</td>
<td>10.1 km (6.3 mi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3162</td>
<td>123</td>
<td>Liquefied gas, poisonous, n.o.s. (Inhalation Hazard Zone B)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
<td>0.9 km (0.6 mi)</td>
<td>400 m (1250 ft)</td>
<td>2.3 km (1.4 mi)</td>
<td>5.1 km (3.2 mi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3162</td>
<td>123</td>
<td>Liquefied gas, poisonous, n.o.s. (Inhalation Hazard Zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.3 km (0.2 mi)</td>
<td>150 m (500 ft)</td>
<td>1.0 km (0.6 mi)</td>
<td>2.9 km (1.8 mi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3162</td>
<td>123</td>
<td>Liquefied gas, poisonous, n.o.s. (Inhalation Hazard Zone D)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
<td>150 m (500 ft)</td>
<td>0.8 km (0.5 mi)</td>
<td>2.0 km (1.3 mi)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES**

**SMALL SPILLS**
(From a small package or small leak from a large package)

**LARGE SPILLS**
(From a large package or from many small packages)
<table>
<thead>
<tr>
<th>Number</th>
<th>Number</th>
<th>Substance Description</th>
<th>Inhalation Hazard Zone A</th>
<th>Inhalation Hazard Zone B</th>
<th>Inhalation Hazard Zone C</th>
<th>Inhalation Hazard Zone D</th>
</tr>
</thead>
<tbody>
<tr>
<td>3162</td>
<td>123</td>
<td>Liquefied gas, toxic, n.o.s.</td>
<td>100 m (300 ft)</td>
<td>0.5 km (0.3 mi)</td>
<td>2.5 km (1.6 mi)</td>
<td>1000 m (3000 ft)</td>
</tr>
<tr>
<td>3162</td>
<td>123</td>
<td>Liquefied gas, toxic, n.o.s. (Inhalation Hazard Zone A)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
<td>0.9 km (0.6 mi)</td>
<td>400 m (1250 ft)</td>
</tr>
<tr>
<td>3162</td>
<td>123</td>
<td>Liquefied gas, toxic, n.o.s. (Inhalation Hazard Zone B)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.3 km (0.2 mi)</td>
<td>150 m (500 ft)</td>
</tr>
<tr>
<td>3162</td>
<td>123</td>
<td>Liquefied gas, toxic, n.o.s. (Inhalation Hazard Zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
<td>150 m (500 ft)</td>
</tr>
<tr>
<td>3246</td>
<td>156</td>
<td>Methanesulfonyl chloride</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.2 mi)</td>
<td>0.3 km (0.2 mi)</td>
<td>60 m (200 ft)</td>
</tr>
<tr>
<td>3246</td>
<td>156</td>
<td>Methanesulphonyl chloride</td>
<td>30 m (100 ft)</td>
<td>0.3 km (0.2 mi)</td>
<td>0.7 km (0.5 mi)</td>
<td>150 m (500 ft)</td>
</tr>
<tr>
<td>3275</td>
<td>131</td>
<td>Nitriles, poisonous, flammable, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.3 km (0.2 mi)</td>
<td>0.7 km (0.5 mi)</td>
<td>150 m (500 ft)</td>
</tr>
<tr>
<td>3275</td>
<td>131</td>
<td>Nitriles, toxic, flammable, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.3 km (0.2 mi)</td>
<td>0.7 km (0.5 mi)</td>
<td>150 m (500 ft)</td>
</tr>
<tr>
<td>3276</td>
<td>151</td>
<td>Nitriles, liquid, poisonous, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.3 km (0.2 mi)</td>
<td>0.7 km (0.5 mi)</td>
<td>150 m (500 ft)</td>
</tr>
<tr>
<td>3276</td>
<td>151</td>
<td>Nitriles, liquid, toxic, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.3 km (0.2 mi)</td>
<td>0.7 km (0.5 mi)</td>
<td>150 m (500 ft)</td>
</tr>
<tr>
<td>3276</td>
<td>151</td>
<td>Nitriles, poisonous, liquid, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.3 km (0.2 mi)</td>
<td>0.7 km (0.5 mi)</td>
<td>150 m (500 ft)</td>
</tr>
<tr>
<td>3276</td>
<td>151</td>
<td>Nitriles, poisonous, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.3 km (0.2 mi)</td>
<td>0.7 km (0.5 mi)</td>
<td>150 m (500 ft)</td>
</tr>
<tr>
<td>3276</td>
<td>151</td>
<td>Nitriles, toxic, liquid, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.3 km (0.2 mi)</td>
<td>0.7 km (0.5 mi)</td>
<td>150 m (500 ft)</td>
</tr>
<tr>
<td>3276</td>
<td>151</td>
<td>Nitriles, toxic, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.3 km (0.2 mi)</td>
<td>0.7 km (0.5 mi)</td>
<td>150 m (500 ft)</td>
</tr>
</tbody>
</table>

"+" means distance can be larger in certain atmospheric conditions.
<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide</th>
<th>NAME OF MATERIAL</th>
<th>SMALL SPILLS</th>
<th>LARGE SPILLS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>First ISOLATE</td>
<td>First ISOLATE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>in all Directions</td>
<td>in all Directions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Metres (Feet)</td>
<td>Metres (Feet)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Then PROTECT persons Downwind during</td>
<td>Then PROTECT persons Downwind during</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DAY</td>
<td>NIGHT</td>
</tr>
<tr>
<td>3278</td>
<td>151</td>
<td>Organophosphorus compound, liquid, poisonous, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.4 km (0.3 mi)</td>
</tr>
<tr>
<td>3278</td>
<td>151</td>
<td>Organophosphorus compound, liquid, toxic, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.4 km (0.3 mi)</td>
</tr>
<tr>
<td>3278</td>
<td>151</td>
<td>Organophosphorus compound, poisonous, liquid, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.4 km (0.3 mi)</td>
</tr>
<tr>
<td>3278</td>
<td>151</td>
<td>Organophosphorus compound, poisonous, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.4 km (0.3 mi)</td>
</tr>
<tr>
<td>3278</td>
<td>151</td>
<td>Organophosphorus compound, toxic, liquid, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.4 km (0.3 mi)</td>
</tr>
<tr>
<td>3278</td>
<td>151</td>
<td>Organophosphorus compound, toxic, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.4 km (0.3 mi)</td>
</tr>
<tr>
<td>3279</td>
<td>131</td>
<td>Organophosphorus compound, poisonous, flammable, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.4 km (0.3 mi)</td>
</tr>
<tr>
<td>3279</td>
<td>131</td>
<td>Organophosphorus compound, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.4 km (0.3 mi)</td>
</tr>
<tr>
<td>3280</td>
<td>151</td>
<td>Organoarsenic compound, liquid, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>3280</td>
<td>151</td>
<td>Organoarsenic compound, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>3281</td>
<td>151</td>
<td>Metal carbonyls, liquid, n.o.s.</td>
<td>100 m (300 ft)</td>
<td>1.3 km (0.8 mi)</td>
</tr>
<tr>
<td>3281</td>
<td>151</td>
<td>Metal carbonyls, n.o.s.</td>
<td>100 m (300 ft)</td>
<td>1.3 km (0.8 mi)</td>
</tr>
<tr>
<td>3294</td>
<td>131</td>
<td>Hydrogen cyanide, solution in alcohol, with not more than 45% Hydrogen cyanide</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Distance (m) (ft)</td>
<td>Distance (km) (mi)</td>
<td>Distance (km) (mi)</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>------------------</td>
<td>--------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>3300</td>
<td>Carbon dioxide and Ethylene oxide mixture, with more than 87% Ethylene oxide</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.2 mi)</td>
</tr>
<tr>
<td>3300</td>
<td>Ethylene oxide and Carbon dioxide mixture, with more than 87% Ethylene oxide</td>
<td>100 m (300 ft)</td>
<td>0.5 km (0.3 mi)</td>
<td>2.5 km (1.6 mi)</td>
</tr>
<tr>
<td>3303</td>
<td>Compressed gas, poisonous, oxidizing, n.o.s. (Inhalation Hazard Zone A)</td>
<td>60 m (200 ft)</td>
<td>0.3 km (0.2 mi)</td>
<td>1.1 km (0.7 mi)</td>
</tr>
<tr>
<td>3303</td>
<td>Compressed gas, poisonous, oxidizing, n.o.s. (Inhalation Hazard Zone B)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.3 km (0.2 mi)</td>
</tr>
<tr>
<td>3303</td>
<td>Compressed gas, poisonous, oxidizing, n.o.s. (Inhalation Hazard Zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>3303</td>
<td>Compressed gas, toxic, oxidizing, n.o.s. (Inhalation Hazard Zone D)</td>
<td>100 m (300 ft)</td>
<td>0.5 km (0.3 mi)</td>
<td>2.5 km (1.6 mi)</td>
</tr>
<tr>
<td>3303</td>
<td>Compressed gas, toxic, oxidizing, n.o.s. (Inhalation Hazard Zone A)</td>
<td>60 m (200 ft)</td>
<td>0.3 km (0.2 mi)</td>
<td>1.1 km (0.7 mi)</td>
</tr>
<tr>
<td>3303</td>
<td>Compressed gas, toxic, oxidizing, n.o.s. (Inhalation Hazard Zone B)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.3 km (0.2 mi)</td>
</tr>
</tbody>
</table>

"+" means distance can be larger in certain atmospheric conditions.
## TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide</th>
<th>NAME OF MATERIAL</th>
<th>SMALL SPILLS (From a small package or small leak from a large package)</th>
<th>LARGE SPILLS (From a large package or from many small packages)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>First ISOLATE in all Directions</td>
<td>Then PROTECT persons Downwind during</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Metres (Feet)</td>
<td>DAY Kilometres (Miles)</td>
</tr>
<tr>
<td>3303</td>
<td>124</td>
<td>Compressed gas, toxic, oxidizing, n.o.s. (Inhalation Hazard Zone D)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3304</td>
<td>125</td>
<td>Compressed gas, poisonous, corrosive, n.o.s.</td>
<td>100 m (300 ft)</td>
<td>0.5 km (0.3 mi)</td>
</tr>
<tr>
<td>3304</td>
<td>125</td>
<td>Compressed gas, poisonous, corrosive, n.o.s. (Inhalation Hazard Zone A)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.2 mi)</td>
</tr>
<tr>
<td>3304</td>
<td>125</td>
<td>Compressed gas, poisonous, corrosive, n.o.s. (Inhalation Hazard Zone B)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3304</td>
<td>125</td>
<td>Compressed gas, poisonous, corrosive, n.o.s. (Inhalation Hazard Zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3304</td>
<td>125</td>
<td>Compressed gas, poisonous, corrosive, n.o.s. (Inhalation Hazard Zone D)</td>
<td>100 m (300 ft)</td>
<td>0.5 km (0.3 mi)</td>
</tr>
</tbody>
</table>

*Note: In an emergency, in Australia call 000, in New Zealand call 111.*
<table>
<thead>
<tr>
<th>Code</th>
<th>Hazard</th>
<th>Distance</th>
<th>Distance</th>
<th>Distance</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
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<tr>
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<th>Description</th>
<th>Distance (m)</th>
<th>Distance (ft)</th>
<th>Distance (km)</th>
<th>Distance (mi)</th>
<th>Distance (mi)</th>
</tr>
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<tbody>
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<td>3310</td>
<td>Liquefied gas, poisonous, oxidizing, corrosive, n.o.s.</td>
<td>30 m</td>
<td>100 ft</td>
<td>0.1 km</td>
<td>0.1 mi</td>
<td>0.2 km</td>
</tr>
<tr>
<td></td>
<td>(Inhalation Hazard Zone C)</td>
<td></td>
<td></td>
<td>0.5 km</td>
<td>0.3 mi</td>
<td>0.8 km</td>
</tr>
<tr>
<td></td>
<td></td>
<td>300 m</td>
<td>1000 ft</td>
<td>1.6 km</td>
<td>1.0 mi</td>
<td>3.2 km</td>
</tr>
</tbody>
</table>

<table>
<thead>
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<td>30 m</td>
<td>100 ft</td>
<td>0.1 km</td>
<td>0.1 mi</td>
<td>0.2 km</td>
</tr>
<tr>
<td></td>
<td>(Inhalation Hazard Zone D)</td>
<td></td>
<td></td>
<td>0.2 km</td>
<td>0.1 mi</td>
<td>0.8 km</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150 m</td>
<td>500 ft</td>
<td>0.8 km</td>
<td>0.5 mi</td>
<td>2.0 km</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Code</th>
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<th>Distance (m)</th>
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<th>Distance (km)</th>
<th>Distance (mi)</th>
<th>Distance (mi)</th>
</tr>
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<tbody>
<tr>
<td>3310</td>
<td>Liquefied gas, toxic, oxidizing, corrosive, n.o.s.</td>
<td>100 m</td>
<td>300 ft</td>
<td>0.5 km</td>
<td>0.3 mi</td>
<td>2.5 km</td>
</tr>
<tr>
<td></td>
<td>(Inhalation Hazard Zone A)</td>
<td></td>
<td></td>
<td>5.0 km</td>
<td>1.6 mi</td>
<td>9.2 km</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500 m</td>
<td>1650 ft</td>
<td>2.9 km</td>
<td>1.8 mi</td>
<td>19.2 km</td>
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<table>
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<th>Distance (ft)</th>
<th>Distance (km)</th>
<th>Distance (mi)</th>
<th>Distance (mi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3310</td>
<td>Liquefied gas, toxic, oxidizing, corrosive, n.o.s.</td>
<td>30 m</td>
<td>100 ft</td>
<td>0.2 km</td>
<td>0.2 mi</td>
<td>1.0 km</td>
</tr>
<tr>
<td></td>
<td>(Inhalation Hazard Zone B)</td>
<td></td>
<td></td>
<td>1.0 km</td>
<td>0.7 mi</td>
<td>2.3 km</td>
</tr>
<tr>
<td></td>
<td></td>
<td>400 m</td>
<td>1250 ft</td>
<td>2.3 km</td>
<td>1.4 mi</td>
<td>5.1 km</td>
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</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Distance (m)</th>
<th>Distance (ft)</th>
<th>Distance (km)</th>
<th>Distance (mi)</th>
<th>Distance (mi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3310</td>
<td>Liquefied gas, toxic, oxidizing, corrosive, n.o.s.</td>
<td>30 m</td>
<td>100 ft</td>
<td>0.1 km</td>
<td>0.1 mi</td>
<td>0.5 km</td>
</tr>
<tr>
<td></td>
<td>(Inhalation Hazard Zone C)</td>
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<td></td>
<td>0.5 km</td>
<td>0.3 mi</td>
<td>0.8 km</td>
</tr>
<tr>
<td></td>
<td></td>
<td>300 m</td>
<td>1000 ft</td>
<td>1.6 km</td>
<td>1.0 mi</td>
<td>3.2 km</td>
</tr>
</tbody>
</table>

<table>
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<tr>
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</tr>
</thead>
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<td>3310</td>
<td>Liquefied gas, toxic, oxidizing, corrosive, n.o.s.</td>
<td>30 m</td>
<td>100 ft</td>
<td>0.1 km</td>
<td>0.1 mi</td>
<td>0.2 km</td>
</tr>
<tr>
<td></td>
<td>(Inhalation Hazard Zone D)</td>
<td></td>
<td></td>
<td>0.2 km</td>
<td>0.1 mi</td>
<td>0.8 km</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150 m</td>
<td>500 ft</td>
<td>0.8 km</td>
<td>0.5 mi</td>
<td>2.0 km</td>
</tr>
</tbody>
</table>

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<tr>
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<th>Distance (km)</th>
<th>Distance (mi)</th>
<th>Distance (mi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3318</td>
<td>Ammonia solution, with more than 50% Ammonia</td>
<td>30 m</td>
<td>100 ft</td>
<td>0.1 km</td>
<td>0.1 mi</td>
<td>0.2 km</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.5 km</td>
<td>0.9 mi</td>
<td>2.1 km</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150 m</td>
<td>500 ft</td>
<td>0.8 km</td>
<td>0.5 mi</td>
<td>2.1 km</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Code</th>
<th>Description</th>
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<th>Distance (ft)</th>
<th>Distance (km)</th>
<th>Distance (mi)</th>
<th>Distance (mi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3355</td>
<td>Insecticide gas, poisonous, flammable, n.o.s.</td>
<td>150 m</td>
<td>500 ft</td>
<td>1.0 km</td>
<td>0.6 mi</td>
<td>3.8 km</td>
</tr>
<tr>
<td></td>
<td>(Inhalation Hazard Zone A)</td>
<td></td>
<td></td>
<td>3.8 km</td>
<td>2.4 mi</td>
<td>10.1 km</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Distance (m)</th>
<th>Distance (ft)</th>
<th>Distance (km)</th>
<th>Distance (mi)</th>
<th>Distance (mi)</th>
</tr>
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<tbody>
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<td>3355</td>
<td>Insecticide gas, poisonous, flammable, n.o.s.</td>
<td>150 m</td>
<td>500 ft</td>
<td>1.0 km</td>
<td>0.6 mi</td>
<td>3.8 km</td>
</tr>
<tr>
<td></td>
<td>(Inhalation Hazard Zone A)</td>
<td></td>
<td></td>
<td>3.8 km</td>
<td>2.4 mi</td>
<td>10.1 km</td>
</tr>
</tbody>
</table>

"+" means distance can be larger in certain atmospheric conditions.
<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide</th>
<th>NAME OF MATERIAL</th>
<th>SMALL SPILLS</th>
<th>LARGE SPILLS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>First ISOLATE in all Directions</td>
<td>Then PROTECT persons Downwind during</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Metres (Feet)</td>
<td>Kilometres (Miles)</td>
</tr>
<tr>
<td>3355</td>
<td>119</td>
<td>Insecticide gas, poisonous,</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flammable, n.o.s. (Inhalation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hazard Zone B)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3355</td>
<td>119</td>
<td>Insecticide gas, poisonous,</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flammable, n.o.s. (Inhalation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hazard Zone C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3355</td>
<td>119</td>
<td>Insecticide gas, poisonous,</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
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<td></td>
<td>flammable, n.o.s. (Inhalation</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Hazard Zone D)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3355</td>
<td>119</td>
<td>Insecticide gas, toxic,</td>
<td>150 m (500 ft)</td>
<td>1.0 km (0.6 mi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flammable, n.o.s. (Inhalation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hazard Zone A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3355</td>
<td>119</td>
<td>Insecticide gas, toxic,</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flammable, n.o.s. (Inhalation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hazard Zone B)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3355</td>
<td>119</td>
<td>Insecticide gas, toxic,</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flammable, n.o.s. (Inhalation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hazard Zone C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3355</td>
<td>119</td>
<td>Insecticide gas, toxic,</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>Chlorosilanes, poisonous, corrosive, n.o.s. (when spilled in water)</td>
<td>60 m (200 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.2 km (0.1 mi)</td>
<td>30 m (100 ft)</td>
</tr>
<tr>
<td>Chlorosilanes, toxic, corrosive, n.o.s. (when spilled in water)</td>
<td>200 m (600 ft)</td>
<td>0.5 km (0.3 mi)</td>
<td>0.7 km (0.4 mi)</td>
<td>60 m (200 ft)</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide</th>
<th>NAME OF MATERIAL</th>
<th>First ISOLATE in all Directions</th>
<th>Then PROTECT persons Downwind during</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Metres (Feet)</td>
<td>DAY Kilometres (Miles)</td>
</tr>
<tr>
<td>3385</td>
<td>139</td>
<td>Poisonous by inhalation liquid, water-reactive, n.o.s (Inhalation Hazard Zone A)</td>
<td>60 m (200 ft)</td>
<td>0.6 km (0.4 mi)</td>
</tr>
<tr>
<td>3385</td>
<td>139</td>
<td>Toxic by inhalation liquid, water-reactive, n.o.s (Inhalation Hazard Zone A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3386</td>
<td>139</td>
<td>Poisonous by inhalation liquid, water-reactive, n.o.s (Inhalation Hazard Zone B)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>3386</td>
<td>139</td>
<td>Toxic by inhalation liquid, water-reactive, n.o.s (Inhalation Hazard Zone B)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3387</td>
<td>142</td>
<td>Poisonous by inhalation liquid, oxidizing, n.o.s (Inhalation Hazard Zone A)</td>
<td>60 m (200 ft)</td>
<td>0.6 km (0.4 mi)</td>
</tr>
<tr>
<td>3387</td>
<td>142</td>
<td>Toxic by inhalation liquid, oxidizing, n.o.s (Inhalation Hazard Zone A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3388</td>
<td>142</td>
<td>Poisonous by inhalation liquid, oxidizing, n.o.s (Inhalation Hazard Zone B)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3388</td>
<td>142</td>
<td>Toxic by inhalation liquid, oxidizing, n.o.s (Inhalation Hazard Zone B)</td>
<td></td>
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</tbody>
</table>

**TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES**

<table>
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<tr>
<th>UN No.</th>
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<th>First ISOLATE in all Directions</th>
<th>Then PROTECT persons Downwind during</th>
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<td></td>
<td>Metres (Feet)</td>
<td>DAY Kilometres (Miles)</td>
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<td>139</td>
<td>Poisonous by inhalation liquid, water-reactive, n.o.s (Inhalation Hazard Zone A)</td>
<td>60 m (200 ft)</td>
<td>0.6 km (0.4 mi)</td>
</tr>
<tr>
<td>3385</td>
<td>139</td>
<td>Toxic by inhalation liquid, water-reactive, n.o.s (Inhalation Hazard Zone A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3386</td>
<td>139</td>
<td>Poisonous by inhalation liquid, water-reactive, n.o.s (Inhalation Hazard Zone B)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>3386</td>
<td>139</td>
<td>Toxic by inhalation liquid, water-reactive, n.o.s (Inhalation Hazard Zone B)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3387</td>
<td>142</td>
<td>Poisonous by inhalation liquid, oxidizing, n.o.s (Inhalation Hazard Zone A)</td>
<td>60 m (200 ft)</td>
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<td>3387</td>
<td>142</td>
<td>Toxic by inhalation liquid, oxidizing, n.o.s (Inhalation Hazard Zone A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3388</td>
<td>142</td>
<td>Poisonous by inhalation liquid, oxidizing, n.o.s (Inhalation Hazard Zone B)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3388</td>
<td>142</td>
<td>Toxic by inhalation liquid, oxidizing, n.o.s (Inhalation Hazard Zone B)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Substance</td>
<td>Hazard Zone A</td>
<td>Hazard Zone B</td>
<td>Hazard Zone A</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------------------------------------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>3389</td>
<td>Poisonous by inhalation liquid, corrosive, n.o.s.</td>
<td>100 m (300 ft)  0.3 km (0.2 mi)  0.8 km (0.5 mi)  400 m (1250 ft)  1.4 km (0.9 mi)  3.3 km (2.1 mi)</td>
<td>30 m (100 ft)  0.2 km (0.1 mi)  0.2 km (0.1 mi)  30 m (100 ft)  0.4 km (0.3 mi)  0.6 km (0.4 mi)</td>
<td>30 m (100 ft)  0.1 km (0.1 mi)  0.2 km (0.1 mi)  60 m (200 ft)  0.3 km (0.2 mi)  1.2 km (0.8 mi)</td>
</tr>
<tr>
<td>3390</td>
<td>Poisonous by inhalation liquid, corrosive, n.o.s.</td>
<td>300 m (1000 ft)  1.0 km (0.6 mi)  2.0 km (1.2 mi)  400 m (1250 ft)  4.8 km (3.0 mi)  7.5 km (4.7 mi)</td>
<td>300 m (1000 ft)  1.0 km (0.6 mi)  2.0 km (1.2 mi)  400 m (1250 ft)  4.8 km (3.0 mi)  7.5 km (4.7 mi)</td>
<td>100 m (300 ft)  0.9 km (0.6 mi)  2.0 km (1.2 mi)  400 m (1250 ft)  4.8 km (3.0 mi)  7.5 km (4.7 mi)</td>
</tr>
<tr>
<td>3416</td>
<td>CN (when used as a weapon)</td>
<td>30 m (100 ft)  0.1 km (0.1 mi)  0.2 km (0.1 mi)  60 m (200 ft)  0.3 km (0.2 mi)  1.2 km (0.8 mi)</td>
<td>30 m (100 ft)  0.1 km (0.1 mi)  0.2 km (0.1 mi)  60 m (200 ft)  0.3 km (0.2 mi)  1.2 km (0.8 mi)</td>
<td>30 m (100 ft)  0.1 km (0.1 mi)  0.2 km (0.1 mi)  60 m (200 ft)  0.3 km (0.2 mi)  1.2 km (0.8 mi)</td>
</tr>
<tr>
<td>3456</td>
<td>Nitrosylsulfuric acid, solid (when spilled in water)</td>
<td>30 m (100 ft)  0.1 km (0.1 mi)  0.3 km (0.2 mi)  300 m (1000 ft)  1.0 km (0.6 mi)  2.9 km (1.8 mi)</td>
<td>30 m (100 ft)  0.1 km (0.1 mi)  0.3 km (0.2 mi)  300 m (1000 ft)  1.0 km (0.6 mi)  2.9 km (1.8 mi)</td>
<td>30 m (100 ft)  0.1 km (0.1 mi)  0.3 km (0.2 mi)  300 m (1000 ft)  1.0 km (0.6 mi)  2.9 km (1.8 mi)</td>
</tr>
<tr>
<td>3488</td>
<td>Poisonous by inhalation liquid, flammable, corrosive, n.o.s.</td>
<td>100 m (300 ft)  0.9 km (0.6 mi)  2.0 km (1.2 mi)  400 m (1250 ft)  4.8 km (3.0 mi)  7.5 km (4.7 mi)</td>
<td>100 m (300 ft)  0.9 km (0.6 mi)  2.0 km (1.2 mi)  400 m (1250 ft)  4.8 km (3.0 mi)  7.5 km (4.7 mi)</td>
<td>100 m (300 ft)  0.9 km (0.6 mi)  2.0 km (1.2 mi)  400 m (1250 ft)  4.8 km (3.0 mi)  7.5 km (4.7 mi)</td>
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</tbody>
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<th>LARGE SPILLS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(From a small package or small leak from a large package)</td>
<td>(From a large package or from many small packages)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>First ISOLATE in all Directions</td>
<td>First ISOLATE in all Directions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Metres (Feet)</td>
<td>Metres (Feet)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Then PROTECT persons Downwind during</td>
<td>Then PROTECT persons Downwind during</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DAY Kilometres (Miles)</td>
<td>NIGHT Kilometres (Miles)</td>
</tr>
<tr>
<td>3489</td>
<td>131</td>
<td>Poisonous by inhalation liquid, flammable, corrosive, n.o.s. (Inhalation Hazard Zone B)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>3490</td>
<td>155</td>
<td>Poisonous by inhalation liquid, water-reactive, flammable, n.o.s. (Inhalation Hazard Zone A)</td>
<td>60 m (200 ft)</td>
<td>0.5 km (0.3 mi)</td>
</tr>
<tr>
<td>3491</td>
<td>155</td>
<td>Poisonous by inhalation liquid, water-reactive, flammable, n.o.s. (Inhalation Hazard Zone B)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>3492</td>
<td>131</td>
<td>Poisonous by inhalation liquid, corrosive, flammable, n.o.s. (Inhalation Hazard Zone A)</td>
<td>100 m (300 ft)</td>
<td>0.9 km (0.6 mi)</td>
</tr>
<tr>
<td>3492</td>
<td>131</td>
<td>Toxic by inhalation liquid, corrosive, flammable, n.o.s. (Inhalation Hazard Zone A)</td>
<td>100 m (300 ft)</td>
<td>0.9 km (0.6 mi)</td>
</tr>
<tr>
<td>Number</td>
<td>Code</td>
<td>Substance Description</td>
<td>Distance (m)</td>
<td>Distance (km)</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td>-----------------------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>3493</td>
<td>131</td>
<td>Poisonous by inhalation liquid, corrosive, flammable, n.o.s. (Inhalation Hazard Zone B)</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>3493</td>
<td>131</td>
<td>Toxic by inhalation liquid, corrosive, flammable, n.o.s. (Inhalation Hazard Zone B)</td>
<td>60 m (200 ft)</td>
<td>0.6 km (0.4 mi)</td>
</tr>
<tr>
<td>3494</td>
<td>131</td>
<td>Petroleum sour crude oil, flammable, poisonous</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.1 mi)</td>
</tr>
<tr>
<td>3494</td>
<td>131</td>
<td>Petroleum sour crude oil, flammable, toxic</td>
<td>60 m (200 ft)</td>
<td>0.5 km (0.3 mi)</td>
</tr>
<tr>
<td>3507</td>
<td>166</td>
<td>Uranium hexafluoride, radioactive material, excepted package, less than 0.1 kg per package, non-fissile or fissile-excepted (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3512</td>
<td>173</td>
<td>Adsorbed gas, poisonous, n.o.s. (Inhalation hazard zone A)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3512</td>
<td>173</td>
<td>Adsorbed gas, poisonous, n.o.s. (Inhalation hazard zone B)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3512</td>
<td>173</td>
<td>Adsorbed gas, poisonous, n.o.s. (Inhalation hazard zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3512</td>
<td>173</td>
<td>Adsorbed gas, poisonous, n.o.s. (Inhalation hazard zone D)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3512</td>
<td>173</td>
<td>Adsorbed gas, toxic, n.o.s. (Inhalation hazard zone A)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3512</td>
<td>173</td>
<td>Adsorbed gas, toxic, n.o.s. (Inhalation hazard zone B)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3512</td>
<td>173</td>
<td>Adsorbed gas, toxic, n.o.s. (Inhalation hazard zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3512</td>
<td>173</td>
<td>Adsorbed gas, toxic, n.o.s. (Inhalation hazard zone D)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
</tbody>
</table>

"+" means distance can be larger in certain atmospheric conditions.
<p>| UN No. | Guide | NAME OF MATERIAL | SMALL SPILLS | | LARGE SPILLS |
|--------|-------|------------------|--------------|------------------|
|        |       |                  | First ISOLATE in all Directions | Then PROTECT persons Downwind during | First ISOLATE in all Directions | Then PROTECT persons Downwind during |
|        |       |                  | Metres (Feet) | DAY Kilometres (Miles) | NIGHT Kilometres (Miles) | Metres (Feet) | DAY Kilometres (Miles) | NIGHT Kilometres (Miles) |
| 3512   | 173  | Adsorbed gas, toxic, n.o.s. (Inhalation hazard zone B) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) |
| 3512   | 173  | Adsorbed gas, toxic, n.o.s. (Inhalation hazard zone C) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.2 km (0.2 mi) |
| 3512   | 173  | Adsorbed gas, toxic, n.o.s. (Inhalation hazard zone D) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) |
| 3514   | 173  | Adsorbed gas, poisonous, flammable, n.o.s. (Inhalation hazard zone A) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) |
| 3514   | 173  | Adsorbed gas, poisonous, flammable, n.o.s. (Inhalation hazard zone B) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) |
| 3514   | 173  | Adsorbed gas, poisonous, flammable, n.o.s. (Inhalation hazard zone C) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.2 km (0.2 mi) |
| 3514   | 173  | Adsorbed gas, poisonous, flammable, n.o.s. (Inhalation hazard zone D) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) |
| 3514   | 173  | Adsorbed gas, toxic, flammable, n.o.s. (Inhalation hazard zone A) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.2 km (0.2 mi) |</p>
<table>
<thead>
<tr>
<th>Code</th>
<th>Value</th>
<th>Description</th>
<th>Distance A</th>
<th>Distance B</th>
<th>Distance C</th>
<th>Distance D</th>
</tr>
</thead>
<tbody>
<tr>
<td>3514</td>
<td>173</td>
<td>Adsorbed gas, toxic, flammable, n.o.s. (Inhalation hazard zone B)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>30 m (100 ft)</td>
</tr>
<tr>
<td>3514</td>
<td>173</td>
<td>Adsorbed gas, toxic, flammable, n.o.s. (Inhalation hazard zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>30 m (100 ft)</td>
</tr>
<tr>
<td>3514</td>
<td>173</td>
<td>Adsorbed gas, toxic, flammable, n.o.s. (Inhalation hazard zone D)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>30 m (100 ft)</td>
</tr>
<tr>
<td>3515</td>
<td>173</td>
<td>Adsorbed gas, poisonous, oxidizing, n.o.s. (Inhalation hazard zone A)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>30 m (100 ft)</td>
</tr>
<tr>
<td>3515</td>
<td>173</td>
<td>Adsorbed gas, poisonous, oxidizing, n.o.s. (Inhalation hazard zone B)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>30 m (100 ft)</td>
</tr>
<tr>
<td>3515</td>
<td>173</td>
<td>Adsorbed gas, poisonous, oxidizing, n.o.s. (Inhalation hazard zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>30 m (100 ft)</td>
</tr>
<tr>
<td>3515</td>
<td>173</td>
<td>Adsorbed gas, poisonous, oxidizing, n.o.s. (Inhalation hazard zone D)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
<td>30 m (100 ft)</td>
</tr>
</tbody>
</table>

"+" means distance can be larger in certain atmospheric conditions.
<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide</th>
<th>NAME OF MATERIAL</th>
<th>SMALL SPILLS</th>
<th></th>
<th>LARGE SPILLS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>First ISOLATE in all Directions</td>
<td>Then PROTECT persons Downwind during</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Metres (Feet)</td>
<td>metres (Kilometres (Miles))</td>
<td>nights (Kilometres (Miles))</td>
</tr>
<tr>
<td>3515</td>
<td>173</td>
<td>Adsorbed gas, toxic, oxidizing, n.o.s. (Inhalation hazard zone B)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3515</td>
<td>173</td>
<td>Adsorbed gas, toxic, oxidizing, n.o.s. (Inhalation hazard zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3515</td>
<td>173</td>
<td>Adsorbed gas, toxic, oxidizing, n.o.s. (Inhalation hazard zone D)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3516</td>
<td>173</td>
<td>Adsorbed gas, poisonous, corrosive, n.o.s.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3516</td>
<td>173</td>
<td>Adsorbed gas, poisonous, corrosive, n.o.s. (Inhalation hazard zone A)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3516</td>
<td>173</td>
<td>Adsorbed gas, poisonous, corrosive, n.o.s. (Inhalation hazard zone B)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3516</td>
<td>173</td>
<td>Adsorbed gas, poisonous, corrosive, n.o.s. (Inhalation hazard zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3516</td>
<td>173</td>
<td>Adsorbed gas, poisonous, corrosive, n.o.s. (Inhalation hazard zone D)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In an emergency, in Australia call 000 | In New Zealand call 111
| 3516 | 173 | Adsorbed gas, toxic, corrosive, n.o.s. (Inhalation hazard zone A) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.2 km (0.2 mi) |
| 3516 | 173 | Adsorbed gas, toxic, corrosive, n.o.s. (Inhalation hazard zone B) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) |
| 3516 | 173 | Adsorbed gas, toxic, corrosive, n.o.s. (Inhalation hazard zone C) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) |
| 3516 | 173 | Adsorbed gas, toxic, corrosive, n.o.s. (Inhalation hazard zone D) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.2 km (0.2 mi) |
| 3517 | 173 | Adsorbed gas, poisonous, flammable, corrosive, n.o.s. (Inhalation hazard zone A) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.2 km (0.2 mi) |
| 3517 | 173 | Adsorbed gas, poisonous, flammable, corrosive, n.o.s. (Inhalation hazard zone B) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) |
| 3517 | 173 | Adsorbed gas, poisonous, flammable, corrosive, n.o.s. (Inhalation hazard zone C) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) |
| 3517 | 173 | Adsorbed gas, poisonous, flammable, corrosive, n.o.s. (Inhalation hazard zone D) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) | 30 m (100 ft) | 0.1 km (0.1 mi) | 0.1 km (0.1 mi) |

"+" means distance can be larger in certain atmospheric conditions.
## TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide</th>
<th>NAME OF MATERIAL</th>
<th>SMALL SPILLS (From a small package or small leak from a large package)</th>
<th>LARGE SPILLS (From a large package or from many small packages)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>First ISOLATE in all Directions</strong> Metres (Feet)</td>
<td><strong>Then PROTECT persons Downwind during</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>DAY Kilometres (Miles)</strong></td>
<td><strong>NIGHT Kilometres (Miles)</strong></td>
</tr>
<tr>
<td>3517</td>
<td>173</td>
<td>Adsorbed gas, toxic, flammable, corrosive, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3517</td>
<td>173</td>
<td>Adsorbed gas, toxic, flammable, corrosive, n.o.s. (Inhalation hazard zone A)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3517</td>
<td>173</td>
<td>Adsorbed gas, toxic, flammable, corrosive, n.o.s. (Inhalation hazard zone B)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3517</td>
<td>173</td>
<td>Adsorbed gas, toxic, flammable, corrosive, n.o.s. (Inhalation hazard zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3518</td>
<td>173</td>
<td>Adsorbed gas, poisonous, oxidizing, corrosive, n.o.s. (Inhalation hazard zone A)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3518</td>
<td>173</td>
<td>Adsorbed gas, poisonous, oxidizing, corrosive, n.o.s. (Inhalation hazard zone B)</td>
<td>30 m (100 ft)</td>
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<tr>
<td>3518</td>
<td>173</td>
<td>Adsorbed gas, poisonous, oxidizing, corrosive, n.o.s. (Inhalation hazard zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3518</td>
<td>173</td>
<td>Adsorbed gas, poisonous, oxidizing, corrosive, n.o.s. (Inhalation hazard zone D)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>Location</td>
<td>Compound</td>
<td>Distance A</td>
<td>Distance B</td>
<td>Distance C</td>
</tr>
<tr>
<td>----------</td>
<td>----------</td>
<td>------------</td>
<td>------------</td>
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</tr>
<tr>
<td>3518</td>
<td>Adsorbed gas, toxic, oxidizing, corrosive, n.o.s. (Inhalation hazard zone A)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3518</td>
<td>Adsorbed gas, toxic, oxidizing, corrosive, n.o.s. (Inhalation hazard zone B)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3518</td>
<td>Adsorbed gas, toxic, oxidizing, corrosive, n.o.s. (Inhalation hazard zone C)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3518</td>
<td>Adsorbed gas, toxic, oxidizing, corrosive, n.o.s. (Inhalation hazard zone D)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3519</td>
<td>Boron trifluoride, adsorbed</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3520</td>
<td>Chlorine, adsorbed</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3521</td>
<td>Silicon tetrafluoride, adsorbed</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3522</td>
<td>Arsine, adsorbed</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3523</td>
<td>Germane, adsorbed</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3524</td>
<td>Phosphorus pentfluoride, adsorbed</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3525</td>
<td>Phosphine, adsorbed</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3526</td>
<td>Hydrogen selenide, adsorbed</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>3539</td>
<td>Articles containing toxic gas, n.o.s.</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>9191</td>
<td>Chlorine dioxide, hydrate, frozen (when spilled in water)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
</tbody>
</table>

"+" means distance can be larger in certain atmospheric conditions.
### TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

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<th>UN No.</th>
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<td>First ISOLATE in all Directions</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Metres (Feet)</td>
<td>Kilometres (Miles)</td>
</tr>
<tr>
<td>9202</td>
<td>168</td>
<td>Carbon monoxide, refrigerated liquid (cryogenic liquid)</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>9206</td>
<td>137</td>
<td>Methyl phosphonic dichloride</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>9263</td>
<td>156</td>
<td>Chloropivaloyl chloride</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>9264</td>
<td>151</td>
<td>3,5-Dichloro-2,4,6-trifluoropyridine</td>
<td>30 m (100 ft)</td>
<td>0.1 km (0.1 mi)</td>
</tr>
<tr>
<td>9269</td>
<td>132</td>
<td>Trimethoxysilane</td>
<td>30 m (100 ft)</td>
<td>0.2 km (0.2 mi)</td>
</tr>
</tbody>
</table>

### In an Emergency
- In Australia, call 000.
- In New Zealand, call 111.
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HOW TO USE TABLE 2 – WATER-REACTIVE MATERIALS WHICH PRODUCE TOXIC GASES

Table 2 lists materials which produce large amounts of Toxic Inhalation Hazard (TIH) gases when spilled in water and identifies the TIH gases produced.

The materials are listed by UN number order.

These Water Reactive materials are easily identified in Table 1 as their name is immediately followed by “(when spilled in water)”.

Note 1: The TIH gases indicated in Table 2 are for information purposes only. In Table 1, the initial isolation and protective distances have already taken into consideration the TIH gases produced. For example: Table 2 indicates that UN1689 sodium cyanide, when spilled in water, will generate hydrogen cyanide gas (HCN). In Table 1, you must refer to the distances for sodium cyanide and not the distances for hydrogen cyanide gas.

Note 2: Some water reactive materials are also TIH materials themselves (e.g., Bromine trifluoride (UN1746), Thionyl chloride (UN1836)). In these instances, two entries are provided in Table 1 for land-based and water-based spills. If a Water Reactive material only has one entry in Table 1 for (when spilled in water), and the product is NOT spilled in water, Table 1 and Table 2 do NOT apply. Refer only to the appropriate orange guide.

Note 3: Materials classified as a Division 4.3 are substances that, on contact with water, are liable to become spontaneously FLAMMABLE or give off FLAMMABLE or sometimes TOXIC gases in dangerous quantities. For the purpose of this table, water reactive materials are materials that generate substantial quantities of TOXIC gases rapidly after a spill into water. Therefore, a material classified as a Division 4.3 will not always be included in Table 2.
### Chemical Symbols for TIH Gases:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Br₂</td>
<td>Bromine</td>
<td>HBr</td>
</tr>
<tr>
<td>Cl₂</td>
<td>Chlorine</td>
<td>HCl</td>
</tr>
<tr>
<td>HBr</td>
<td>Hydrogen bromide</td>
<td>H₂S</td>
</tr>
<tr>
<td>HCl</td>
<td>Hydrogen chloride</td>
<td>H₂S</td>
</tr>
<tr>
<td>HCN</td>
<td>Hydrogen cyanide</td>
<td>NH₃</td>
</tr>
<tr>
<td>NO₂</td>
<td>Nitrogen dioxide</td>
<td>PH₃</td>
</tr>
<tr>
<td>PH₃</td>
<td>Phosgene</td>
<td>H₂S SO₂</td>
</tr>
<tr>
<td>H₂SO₂</td>
<td>Sulfur dioxide</td>
<td>SO₂</td>
</tr>
<tr>
<td>SO₂</td>
<td>Phosphine</td>
<td>HCN</td>
</tr>
<tr>
<td>HCN</td>
<td>Ammonia</td>
<td></td>
</tr>
</tbody>
</table>

### Materials Which Produce Large Amounts of Toxic-by-Inhalation (TIH) Gas(es) When Spilled in Water

<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide No.</th>
<th>Name of Material</th>
<th>TIH Gas(es) Produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>1162</td>
<td>155</td>
<td>Dimethyldichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1183</td>
<td>139</td>
<td>Ethyldichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1196</td>
<td>155</td>
<td>Ethyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1242</td>
<td>139</td>
<td>Methylidichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1250</td>
<td>155</td>
<td>Methyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1295</td>
<td>139</td>
<td>Trichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1298</td>
<td>155</td>
<td>Trimethylchlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1305</td>
<td>155P</td>
<td>Vinyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1305</td>
<td>155P</td>
<td>Vinyltrichlorosilane, stabilized</td>
<td>HCl</td>
</tr>
<tr>
<td>1340</td>
<td>139</td>
<td>Phosphorus pentasulfide, free from yellow and white Phosphorus</td>
<td>H₂S</td>
</tr>
<tr>
<td>1384</td>
<td>135</td>
<td>Sodium dithionite</td>
<td>H₂S SO₂</td>
</tr>
<tr>
<td>1384</td>
<td>135</td>
<td>Sodium hydrosulfite</td>
<td>H₂S SO₂</td>
</tr>
<tr>
<td>1384</td>
<td>135</td>
<td>Sodium hydrosulphite</td>
<td>H₂S SO₂</td>
</tr>
<tr>
<td>1397</td>
<td>139</td>
<td>Aluminum phosphide</td>
<td>PH₃</td>
</tr>
<tr>
<td>1419</td>
<td>139</td>
<td>Magnesium aluminum phosphide</td>
<td>PH₃</td>
</tr>
<tr>
<td>1432</td>
<td>139</td>
<td>Sodium phosphide</td>
<td>PH₃</td>
</tr>
<tr>
<td>1541</td>
<td>155</td>
<td>Acetone cyanohydrin, stabilized</td>
<td>HCN</td>
</tr>
<tr>
<td>1680</td>
<td>157</td>
<td>Potassium cyanide</td>
<td>HCN</td>
</tr>
<tr>
<td>1680</td>
<td>157</td>
<td>Potassium cyanide, solid</td>
<td>HCN</td>
</tr>
<tr>
<td>1689</td>
<td>157</td>
<td>Sodium cyanide</td>
<td>HCN</td>
</tr>
<tr>
<td>1689</td>
<td>157</td>
<td>Sodium cyanide, solid</td>
<td>HCN</td>
</tr>
<tr>
<td>1716</td>
<td>156</td>
<td>Acetyl bromide</td>
<td>HBr</td>
</tr>
</tbody>
</table>

**TABLE 2 - WATER-REACTIVE MATERIALS WHICH PRODUCE TOXIC GASES**

In an emergency, in Australia call 000 | In New Zealand call 111
### Chemical Symbols for TIH Gases:

- **Br**<sub>2**</sub>  Bromine
- **Cl**<sub>2**  Chlorine
- **HBr**  Hydrogen bromide
- **HCl**  Hydrogen chloride
- **HCN**  Hydrogen cyanide
- **HF**  Hydrogen fluoride
- **HI**  Hydrogen iodide
- **H<sub>2</sub>S**  Hydrogen sulfide (Sulfur dioxide)

### Materials Which Produce Large Amounts of Toxic-by-Inhalation (TIH) Gas(es) When Spilled in Water

<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide No.</th>
<th>Name of Material</th>
<th>TIH Gas(es) Produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>1717</td>
<td>155</td>
<td>Acetyl chloride</td>
<td>HCl</td>
</tr>
<tr>
<td>1724</td>
<td>155</td>
<td>Allyltrichlorosilane, stabilized</td>
<td>HCl</td>
</tr>
<tr>
<td>1725</td>
<td>137</td>
<td>Aluminum bromide, anhydrous</td>
<td>HBr</td>
</tr>
<tr>
<td>1726</td>
<td>137</td>
<td>Aluminum chloride, anhydrous</td>
<td>HCl</td>
</tr>
<tr>
<td>1728</td>
<td>155</td>
<td>Amyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1732</td>
<td>157</td>
<td>Antimony pentafluoride</td>
<td>HF</td>
</tr>
<tr>
<td>1741</td>
<td>125</td>
<td>Boron trichloride</td>
<td>HCl</td>
</tr>
<tr>
<td>1745</td>
<td>144</td>
<td>Bromine pentafluoride</td>
<td>HF, Br&lt;sub&gt;2**&lt;/sub&gt;</td>
</tr>
<tr>
<td>1746</td>
<td>144</td>
<td>Bromine trifluoride</td>
<td>HF, Br&lt;sub&gt;2**&lt;/sub&gt;</td>
</tr>
<tr>
<td>1747</td>
<td>155</td>
<td>Butyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1752</td>
<td>156</td>
<td>Chloroacetyl chloride</td>
<td>HCl</td>
</tr>
<tr>
<td>1753</td>
<td>156</td>
<td>Chlorophenyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1754</td>
<td>137</td>
<td>Chlorosulfonic acid (with or without sulfur trioxide mixture)</td>
<td>HCl</td>
</tr>
<tr>
<td>1754</td>
<td>137</td>
<td>Chlorosulphonic acid (with or without sulphur trioxide mixture)</td>
<td>HCl</td>
</tr>
<tr>
<td>1758</td>
<td>137</td>
<td>Chromium oxychloride</td>
<td>HCl</td>
</tr>
<tr>
<td>1762</td>
<td>156</td>
<td>Cyclohexenyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1763</td>
<td>156</td>
<td>Cyclohexyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1765</td>
<td>156</td>
<td>Dichloroacetyl chloride</td>
<td>HCl</td>
</tr>
<tr>
<td>1766</td>
<td>156</td>
<td>Dichlorophenyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1767</td>
<td>155</td>
<td>Diethyl dichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1769</td>
<td>156</td>
<td>Diphenyldichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1771</td>
<td>156</td>
<td>Dodecyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1777</td>
<td>137</td>
<td>Fluorosulfonic acid</td>
<td>HF</td>
</tr>
<tr>
<td>1777</td>
<td>137</td>
<td>Fluorosulphonic acid</td>
<td>HF</td>
</tr>
</tbody>
</table>

### Chemical Symbols for TIH Gases:

- **Br**<sub>2**  Bromine
- **Cl**<sub>2**  Chlorine
- **HBr**  Hydrogen bromide
- **HCl**  Hydrogen chloride
- **HCN**  Hydrogen cyanide
- **HF**  Hydrogen fluoride
- **HI**  Hydrogen iodide
- **H<sub>2</sub>S**  Hydrogen sulfide
- **NH<sub>3**  Ammonia
- **NO<sub>2**  Nitrogen dioxide
- **PH<sub>3**  Phosphine
- **SO<sub>2**  Sulfur dioxide
### TABLE 2 - WATER-REACTIVE MATERIALS WHICH PRODUCE TOXIC GASES

Materials Which Produce Large Amounts of Toxic-by-Inhalation (TIH) Gas(es) When Spilled in Water

<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide No.</th>
<th>Name of Material</th>
<th>TIH Gas(es) Produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>1781</td>
<td>156</td>
<td>Hexadecyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1784</td>
<td>156</td>
<td>Hexyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1799</td>
<td>156</td>
<td>Nonyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1800</td>
<td>156</td>
<td>Octadecyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1801</td>
<td>156</td>
<td>Octyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1804</td>
<td>156</td>
<td>Phenyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1806</td>
<td>137</td>
<td>Phosphorus pentachloride</td>
<td>HCl</td>
</tr>
<tr>
<td>1808</td>
<td>137</td>
<td>Phosphorus tribromide</td>
<td>HBr</td>
</tr>
<tr>
<td>1809</td>
<td>137</td>
<td>Phosphorus trichloride</td>
<td>HCl</td>
</tr>
<tr>
<td>1810</td>
<td>137</td>
<td>Phosphorus oxychloride</td>
<td>HCl</td>
</tr>
<tr>
<td>1815</td>
<td>132</td>
<td>Propionyl chloride</td>
<td>HCl</td>
</tr>
<tr>
<td>1816</td>
<td>155</td>
<td>Propyltrichlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>1818</td>
<td>157</td>
<td>Silicon tetrachloride</td>
<td>HCl</td>
</tr>
<tr>
<td>1828</td>
<td>137</td>
<td>Sulfur chlorides</td>
<td>HCl, SO₂, H₂S</td>
</tr>
<tr>
<td>1834</td>
<td>137</td>
<td>Sulfuryl chloride</td>
<td>HCl</td>
</tr>
<tr>
<td>1834</td>
<td>137</td>
<td>Sulphuryl chloride</td>
<td>HCl</td>
</tr>
<tr>
<td>1836</td>
<td>137</td>
<td>Thionyl chloride</td>
<td>HCl, SO₂</td>
</tr>
<tr>
<td>1838</td>
<td>137</td>
<td>Titanium tetrachloride</td>
<td>HCl</td>
</tr>
<tr>
<td>1898</td>
<td>156</td>
<td>Acetyl iodide</td>
<td>HI</td>
</tr>
<tr>
<td>1923</td>
<td>135</td>
<td>Calcium dithionite</td>
<td>H₂S, SO₂</td>
</tr>
<tr>
<td>1923</td>
<td>135</td>
<td>Calcium hydrosulfite</td>
<td>H₂S, SO₂</td>
</tr>
<tr>
<td>1923</td>
<td>135</td>
<td>Calcium hydrosulphite</td>
<td>H₂S, SO₂</td>
</tr>
<tr>
<td>1929</td>
<td>135</td>
<td>Potassium dithionite</td>
<td>H₂S, SO₂</td>
</tr>
</tbody>
</table>

**Chemical Symbols for TIH Gases:**

- Br₂: Bromine
- Cl₂: Chlorine
- HBr: Hydrogen bromide
- HCl: Hydrogen chloride
- HCN: Hydrogen cyanide
- HF: Hydrogen fluoride
- HI: Hydrogen iodide
- H₂S: Hydrogen sulfide
- NH₃: Ammonia
- NO₂: Nitrogen dioxide
- PH₃: Phosphine
- SO₂: Sulfur dioxide
- SO₃: Sulphur dioxide

IN AN EMERGENCY, IN AUSTRALIA CALL 000 | IN NEW ZEALAND CALL 111
# Chemical Symbols for TIH Gases:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Formula</th>
<th>Symbol</th>
<th>Name</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Br₂</td>
<td>Bromine</td>
<td></td>
<td>Cl₂</td>
<td>Chlorine</td>
<td></td>
</tr>
<tr>
<td>HBr</td>
<td>Hydrogen bromide</td>
<td>H₂S</td>
<td>HCl</td>
<td>Hydrogen chloride</td>
<td>H₂S</td>
</tr>
<tr>
<td>HCN</td>
<td>Hydrogen cyanide</td>
<td>NH₃</td>
<td>NO₂</td>
<td>Nitrogen dioxide</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PH₃</td>
<td>Phosphine</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SO₂</td>
<td>Sulfur dioxide</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Table 2 - Water-Reactive Materials Which Produce Toxic Gases

### Materials Which Produce Large Amounts of Toxic-by-Inhalation (TIH) Gas(es) When Spilled in Water

<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide No.</th>
<th>Name of Material</th>
<th>TIH Gas(es) Produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>135</td>
<td>Potassium hydrosulphite</td>
<td>H₂S, SO₂</td>
</tr>
<tr>
<td>1929</td>
<td>135</td>
<td>Potassium hydrosulphite</td>
<td>H₂S, SO₂</td>
</tr>
<tr>
<td>1931</td>
<td>171</td>
<td>Zinc dithionite</td>
<td>H₂S, SO₂</td>
</tr>
<tr>
<td>1931</td>
<td>171</td>
<td>Zinc hydrosulphite</td>
<td>H₂S, SO₂</td>
</tr>
<tr>
<td>1931</td>
<td>171</td>
<td>Zinc hydrosulphite</td>
<td>H₂S, SO₂</td>
</tr>
<tr>
<td>2004</td>
<td>135</td>
<td>Magnesium diamide</td>
<td>NH₃</td>
</tr>
<tr>
<td>2011</td>
<td>139</td>
<td>Magnesium phosphide</td>
<td>PH₃</td>
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<td>2012</td>
<td>139</td>
<td>Potassium phosphide</td>
<td>PH₃</td>
</tr>
<tr>
<td>2013</td>
<td>139</td>
<td>Strontium phosphide</td>
<td>PH₃</td>
</tr>
<tr>
<td>2308</td>
<td>157</td>
<td>Nitrosylsulfuric acid, liquid</td>
<td>NO₂</td>
</tr>
<tr>
<td>2308</td>
<td>157</td>
<td>Nitrosylsulfuric acid, solid</td>
<td>NO₂</td>
</tr>
<tr>
<td>2308</td>
<td>157</td>
<td>Nitrosylsulphuric acid, liquid</td>
<td>NO₂</td>
</tr>
<tr>
<td>2308</td>
<td>157</td>
<td>Nitrosylsulphuric acid, solid</td>
<td>NO₂</td>
</tr>
<tr>
<td>2353</td>
<td>132</td>
<td>Butyryl chloride</td>
<td>HCl</td>
</tr>
<tr>
<td>2395</td>
<td>132</td>
<td>Isobutyryl chloride</td>
<td>HCl</td>
</tr>
<tr>
<td>2434</td>
<td>156</td>
<td>Dibenzylchlorosilane</td>
<td>HCl</td>
</tr>
<tr>
<td>2435</td>
<td>156</td>
<td>Ethylphenylchlorosilane</td>
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<td>2437</td>
<td>156</td>
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<td>HCl</td>
</tr>
<tr>
<td>2495</td>
<td>144</td>
<td>Iodine pentafluoride</td>
<td>HF</td>
</tr>
<tr>
<td>2691</td>
<td>137</td>
<td>Phosphorus pentabromide</td>
<td>HBr</td>
</tr>
<tr>
<td>2692</td>
<td>157</td>
<td>Boron tribromide</td>
<td>HBr</td>
</tr>
<tr>
<td>2806</td>
<td>138</td>
<td>Lithium nitride</td>
<td>NH₃</td>
</tr>
<tr>
<td>2977</td>
<td>166</td>
<td>Radioactive material, Uranium hexafluoride, fissile</td>
<td>HF</td>
</tr>
<tr>
<td>2977</td>
<td>166</td>
<td>Uranium hexafluoride, radioactive material, fissile</td>
<td>HF</td>
</tr>
</tbody>
</table>

### Chemical Symbols for TIH Gases:

- Br₂: Bromine
- Cl₂: Chlorine
- HBr: Hydrogen bromide
- HCl: Hydrogen chloride
- HCN: Hydrogen cyanide
- HF: Hydrogen fluoride
- HI: Hydrogen iodide
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- H₂SO₂: Hydrogen sulphide
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- NO₂: Nitrogen dioxide
- PH₃: Phosphine
- SO₂: Sulfur dioxide
- SO₃: Sulphur dioxide
### Materials Which Produce Large Amounts of Toxic-by-Inhalation (TIH) Gas(es) When Spilled in Water

<table>
<thead>
<tr>
<th>UN No.</th>
<th>Guide No.</th>
<th>Name of Material</th>
<th>TIH Gas(es) Produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>2978</td>
<td>166</td>
<td>Radioactive material, Uranium hexafluoride, non fissile or fissile-exceptioned</td>
<td>HF</td>
</tr>
<tr>
<td>2978</td>
<td>166</td>
<td>Uranium hexafluoride, radioactive material, non fissile or fissile-exceptioned</td>
<td>HF</td>
</tr>
<tr>
<td>2985</td>
<td>155</td>
<td>Chlorosilanes, flammable, corrosive, n.o.s</td>
<td>HCl</td>
</tr>
<tr>
<td>2986</td>
<td>155</td>
<td>Chlorosilanes, corrosive, flammable, n.o.s</td>
<td>HCl</td>
</tr>
<tr>
<td>2987</td>
<td>156</td>
<td>Chlorosilanes, corrosive, n.o.s</td>
<td>HCl</td>
</tr>
<tr>
<td>2988</td>
<td>139</td>
<td>Chlorosilanes, water-reactive, flammable, corrosive, n.o.s.</td>
<td>HCl</td>
</tr>
<tr>
<td>3048</td>
<td>157</td>
<td>Aluminum phosphide pesticide</td>
<td>PH₃</td>
</tr>
<tr>
<td>3049</td>
<td>138</td>
<td>Metal alkyl halides, water-reactive, n.o.s</td>
<td>HCl</td>
</tr>
<tr>
<td>3049</td>
<td>138</td>
<td>Metal aryl halides, water-reactive, n.o.s</td>
<td>HCl</td>
</tr>
<tr>
<td>3052</td>
<td>135</td>
<td>Aluminum alkyl halides, liquid</td>
<td>HCl</td>
</tr>
<tr>
<td>3052</td>
<td>135</td>
<td>Aluminum alkyl halides, solid</td>
<td>HCl</td>
</tr>
<tr>
<td>3361</td>
<td>156</td>
<td>Chlorosilanes, poisonous, corrosive, n.o.s.</td>
<td>HCl</td>
</tr>
<tr>
<td>3361</td>
<td>156</td>
<td>Chlorosilanes, toxic, corrosive, n.o.s.</td>
<td>HCl</td>
</tr>
<tr>
<td>3362</td>
<td>155</td>
<td>Chlorosilanes, poisonous, corrosive, flammable, n.o.s.</td>
<td>HCl</td>
</tr>
<tr>
<td>3362</td>
<td>155</td>
<td>Chlorosilanes, toxic, corrosive, flammable, n.o.s.</td>
<td>HCl</td>
</tr>
<tr>
<td>3456</td>
<td>157</td>
<td>Nitrosylsulfuric acid, solid</td>
<td>NO₂</td>
</tr>
<tr>
<td>3456</td>
<td>157</td>
<td>Nitrosylsulphuric acid, solid</td>
<td>NO₂</td>
</tr>
<tr>
<td>3461</td>
<td>135</td>
<td>Aluminum alkyl halides, solid</td>
<td>HCl</td>
</tr>
<tr>
<td>3507</td>
<td>166</td>
<td>Uranium hexafluoride, radioactive material, excepted package, less than 0.1 kg per package, non-fissile or fissile-exceptioned</td>
<td>HF</td>
</tr>
<tr>
<td>9191</td>
<td>143</td>
<td>Chlorine dioxide, hydrate, frozen</td>
<td>Cl₂</td>
</tr>
</tbody>
</table>

### Chemical Symbols for TIH Gases:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Symbol</th>
<th>Name</th>
<th>Symbol</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Br₂</td>
<td>Bromine</td>
<td>HF</td>
<td>Hydrogen fluoride</td>
<td>NO₂</td>
<td>Nitrogen dioxide</td>
</tr>
<tr>
<td>Cl₂</td>
<td>Chlorine</td>
<td>HI</td>
<td>Hydrogen iodide</td>
<td>PH₃</td>
<td>Phosphine</td>
</tr>
<tr>
<td>HBr</td>
<td>Hydrogen bromide</td>
<td>H₂S</td>
<td>Hydrogen sulfide</td>
<td>SO₂</td>
<td>Sulfur dioxide</td>
</tr>
<tr>
<td>HCl</td>
<td>Hydrogen chloride</td>
<td>H₂S</td>
<td>Hydrogen sulphide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCN</td>
<td>Hydrogen cyanide</td>
<td>NH₃</td>
<td>Ammonia</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3 lists Toxic Inhalation Hazard materials that may be more commonly encountered.

The selected materials are:
- UN1005 - Ammonia, anhydrous
- UN1017 - Chlorine
- UN1040 - Ethylene oxide and UN1040 - Ethylene oxide with nitrogen
- UN1050 - Hydrogen chloride, anhydrous and UN2186 - Hydrogen chloride, refrigerated liquid
- UN1052 - Hydrogen fluoride, anhydrous
- UN1079 - Sulfur dioxide/Sulphur dioxide

The materials are presented in numerical order of UN number and provide Initial Isolation and Protective Action Distances FOR LARGE SPILLS (more than 208 litres or 55 US gallons) involving different container types (therefore different volume capacities) for day time and night time situations and different wind speeds.

- Rail car: 80,000 kg
- Highway tank truck or trailer: 20,000-25,000 kg
- Agricultural nurse tank: 3785 L
- Small cylinder: 72 L
- Ton cylinder: 757-1135 L

### Estimating Wind Speed from Environmental Clues

<table>
<thead>
<tr>
<th>mph</th>
<th>km/h</th>
<th>Wind Description</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 6</td>
<td>&lt; 10</td>
<td>Low wind</td>
<td>Wind felt on face; leaves rustle; ordinary vane moved by wind</td>
</tr>
<tr>
<td>6 - 12</td>
<td>10 - 20</td>
<td>Moderate wind</td>
<td>Raises dust, loose paper; small branches are moved</td>
</tr>
<tr>
<td>&gt; 12</td>
<td>&gt; 20</td>
<td>High wind</td>
<td>Large branches in motion; whistling heard in telephone wires; umbrellas used with difficulty</td>
</tr>
</tbody>
</table>

(Data taken from the Beaufort Wind Scale has been reworked in order to create 3 categories of wind speed: low, moderate and high)
### TABLE 3 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES FOR LARGE SPILLS FOR DIFFERENT QUANTITIES OF SIX COMMON TIH (PIH in the US) GASES

<table>
<thead>
<tr>
<th>First ISOLATE in all Directions</th>
<th>Then PROTECT persons Downwind during</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DAY</td>
</tr>
<tr>
<td></td>
<td>Low wind (6 mph)</td>
</tr>
<tr>
<td></td>
<td>(10 km/h)</td>
</tr>
<tr>
<td></td>
<td>km (Miles)</td>
</tr>
<tr>
<td>TRANSPORT CONTAINER</td>
<td>UN1005 Ammonia, anhydrous: Large Spills</td>
</tr>
<tr>
<td>Rail tank car</td>
<td>300 (1000)</td>
</tr>
<tr>
<td>Highway tank truck or trailer</td>
<td>150 (500)</td>
</tr>
<tr>
<td>Agricultural nurse tank</td>
<td>60 (200)</td>
</tr>
<tr>
<td>Multiple small cylinders</td>
<td>30 (100)</td>
</tr>
<tr>
<td>TRANSPORT CONTAINER</td>
<td>UN1017 Chlorine: Large Spills</td>
</tr>
<tr>
<td>Rail tank car</td>
<td>1000 (3000)</td>
</tr>
<tr>
<td>Highway tank truck or trailer</td>
<td>600 (2000)</td>
</tr>
<tr>
<td>Multiple ton cylinders</td>
<td>300 (1000)</td>
</tr>
<tr>
<td>Multiple small cylinders or single ton cylinder</td>
<td>150 (500)</td>
</tr>
</tbody>
</table>

"+" means distance can be larger in certain atmospheric conditions.
<table>
<thead>
<tr>
<th>TRANSPORT CONTAINER</th>
<th>UN1040 Ethylene oxide: Large Spills</th>
<th>UN1050 Hydrogen chloride, anhydrous: Large Spills</th>
<th>UN2186 Hydrogen chloride, refrigerated liquid: Large Spills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail tank car</td>
<td>Low wind (6 mph 10 km/h) 1.6 (1.0)</td>
<td>Low wind (6 mph 10 km/h) 3.9 (2.5)</td>
<td>Low wind (6 mph 10 km/h) 10.1 (6.3)</td>
</tr>
<tr>
<td></td>
<td>Moderate wind (6-12 mph 10 km/h) 0.8 (0.5)</td>
<td>Moderate wind (6-12 mph 10 km/h) 2.1 (1.2)</td>
<td>Moderate wind (6-12 mph 10 km/h) 3.5 (2.2)</td>
</tr>
<tr>
<td></td>
<td>High wind (&gt; 20 km/h) 0.7 (0.5)</td>
<td>High wind (&gt; 20 km/h) 1.8 (1.2)</td>
<td>High wind (&gt; 20 km/h) 2.3 (1.5)</td>
</tr>
<tr>
<td>Highway tank truck or trailer</td>
<td>Low wind (6 mph 10 km/h) 0.9 (0.6)</td>
<td>Low wind (6 mph 10 km/h) 1.5 (0.9)</td>
<td>Low wind (6 mph 10 km/h) 3.9 (2.5)</td>
</tr>
<tr>
<td></td>
<td>Moderate wind (6-12 mph 10 km/h) 0.5 (0.3)</td>
<td>Moderate wind (6-12 mph 10 km/h) 0.8 (0.5)</td>
<td>Moderate wind (6-12 mph 10 km/h) 1.5 (0.9)</td>
</tr>
<tr>
<td></td>
<td>High wind (&gt; 20 km/h) 0.4 (0.3)</td>
<td>High wind (&gt; 20 km/h) 0.6 (0.4)</td>
<td>High wind (&gt; 20 km/h) 0.8 (0.5)</td>
</tr>
<tr>
<td>Multiple small cylinders or single ton cylinder</td>
<td>Low wind (6 mph 10 km/h) 0.4 (0.3)</td>
<td>Low wind (6 mph 10 km/h) 0.4 (0.3)</td>
<td>Low wind (6 mph 10 km/h) 1.1 (0.7)</td>
</tr>
<tr>
<td></td>
<td>Moderate wind (6-12 mph 10 km/h) 0.2 (0.1)</td>
<td>Moderate wind (6-12 mph 10 km/h) 0.2 (0.1)</td>
<td>Moderate wind (6-12 mph 10 km/h) 0.3 (0.2)</td>
</tr>
<tr>
<td></td>
<td>High wind (&gt; 20 km/h) 0.1 (0.1)</td>
<td>High wind (&gt; 20 km/h) 0.1 (0.1)</td>
<td>High wind (&gt; 20 km/h) 0.2 (0.1)</td>
</tr>
</tbody>
</table>

*“+” means distance can be larger in certain atmospheric conditions*
<table>
<thead>
<tr>
<th>TRANSPORT CONTAINER</th>
<th>UN1052 Hydrogen fluoride, anhydrous: Large Spills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail tank car</td>
<td>500 (1500)</td>
</tr>
<tr>
<td>Highway tank truck or trailer</td>
<td>200 (700)</td>
</tr>
<tr>
<td>Multiple small cylinders or single ton cylinder</td>
<td>100 (300)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TRANSPORT CONTAINER</th>
<th>UN1079 Sulfur dioxide/Sulphur dioxide: Large Spills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail tank car</td>
<td>1000 (3000)</td>
</tr>
<tr>
<td>Highway tank truck or trailer</td>
<td>1000 (3000)</td>
</tr>
<tr>
<td>Multiple ton cylinders</td>
<td>500 (1500)</td>
</tr>
<tr>
<td>Multiple small cylinders or single ton cylinder</td>
<td>200 (600)</td>
</tr>
</tbody>
</table>

"+" means distance can be larger in certain atmospheric conditions.
ANZ-ERG2021 USER’S GUIDE

The 2021 Australian & New Zealand Emergency Response Guidebook (ANZ-ERG2021) is based on the 2020 ERG which was developed jointly by Transport Canada (TC), the U.S. Department of Transportation (DOT), the Secretariat of Communications and Transport of Mexico (SCT) and with the collaboration of CENIM (Centro de Información Mecánica) of Argentina, for use by fire fighters, police, and other emergency services personnel who may be the first to arrive at the scene of a transportation incident involving dangerous goods. It is primarily a guide to aid transport operators and first responders in quickly identifying the specific or generic hazards of the material(s) involved in the incident and protecting themselves and the general public during the initial response phase of the incident.

For the purposes of this guidebook, the initial response phase is that period following arrival at the scene of an incident during which the presence and/or identification of dangerous goods is confirmed, protective actions and area securement are initiated, and assistance of qualified personnel is requested. It is not intended to provide information on the physical or chemical properties of dangerous goods. This guidebook will assist responders in making initial decisions upon arriving at the scene of a dangerous goods incident. It should not be considered as a substitute for emergency response training, knowledge or sound judgment. ANZ-ERG2021 does not address all possible circumstances that may be associated with a dangerous goods incident. It is primarily designed for use at a dangerous goods incident occurring on a highway or railroad.

Be mindful that there may be limited value in its application at fixed facility locations. ANZ-ERG2021 incorporates dangerous goods lists from the most recent United Nations Recommendations as well as from other international and national regulations. Explosives are not listed individually by either proper shipping name or UN Number. They do, however, appear under the general heading Explosives on the first page of the UN Number index (yellow-bordered pages) and alphabetically in the Name of Material index (blue-bordered pages). The letter (P) following the guide number in the yellow-bordered and blue-bordered pages identifies materials that present a polymerization hazard under certain conditions, for example: UN1092 Acrolein, stabilized 131P.

First responders at the scene of a dangerous goods incident should not solely rely on this guidebook. Seek additional specific information about any material in question as soon as possible.

The information received by contacting the appropriate emergency response agency, by calling the emergency response telephone number on the transport document, or by consulting the information on or accompanying the transport document, may be more specific and accurate than this guidebook in providing guidance for the materials involved.

BEFORE AN EMERGENCY – BECOME FAMILIAR WITH THIS GUIDEBOOK!
Guidebook Contents

1-Yellow-bordered pages: Index list of dangerous goods in numerical order of UN number. This list displays the 4-digit UN number of the material followed by its assigned emergency response guide and the material name.

For example:

<table>
<thead>
<tr>
<th>UN No.</th>
<th>GUIDE No.</th>
<th>Name of Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1090</td>
<td>127</td>
<td>Acetone</td>
</tr>
</tbody>
</table>

2-Blue-bordered pages: Index list of dangerous goods in alphabetical order of material name. This list displays the name of the material followed by its assigned emergency response guide and 4-digit UN number.

For example:

<table>
<thead>
<tr>
<th>Name of Material</th>
<th>GUIDE No.</th>
<th>UN No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfuric acid</td>
<td>137</td>
<td>1830</td>
</tr>
</tbody>
</table>

3-Orange-bordered pages: All safety recommendations are provided. It comprises a total of 62 individual guides in a two-page format. Each guide provides safety commendations and emergency response information to protect yourself and the public. The left-hand page provides safety-related information whereas the right-hand page provides emergency response guidance and activities for fire situations, spill or leak incidents and first aid. Each guide applies to a group of materials which possess similar chemical and toxicological characteristics.

The guide title identifies the general hazards of the dangerous goods covered.

For example:

GUIDE 124 - Gases-Toxic and/or Corrosive-Oxidizing.

Each guide is divided into three main sections: the first section describes potential hazards that the material may display in terms of fire/explosion and health effects upon exposure. Primary potential hazard is listed first. The emergency responder should consult this section first to help you make decisions about the protection of the emergency response team as well as the surrounding population.

The second section outlines suggested public safety measures based on the situation at hand. It provides general information regarding immediate isolation of the incident site, recommended type of protective clothing and respiratory protection. Suggested evacuation distances are listed for small and large spills and for fire situations (fragmentation hazard). It also directs the reader to consult the tables listing Toxic Inhalation Hazard (TIH) (PIH in the US) materials, chemical warfare agents and water-reactive materials (green-bordered pages) when the material is highlighted in the yellow-bordered and blue-bordered pages.

The third section covers emergency response actions, including first aid. It outlines special precautions for incidents which involve fire, spill or chemical exposure. Several recommendations are listed under each part which will further assist in the decision-making process. The information on first aid is general guidance prior to seeking medical care.
4-Green-bordered pages: This section contains three tables.

Table 1 lists, by UN number order, TIH (PIH in the US) materials, including certain chemical warfare agents, and water-reactive materials which produce toxic gases upon contact with water. This table provides two different types of recommended safe distances which are Initial isolation distances and Protective action distances. The materials are highlighted in green for easy identification in both numeric (yellow-bordered pages) and alphabetic (blue-bordered pages) lists of the guidebook. This table provides distances for both small (approximately 208 litres (55 US gallons) or less for liquids and 300 kilograms (660 pounds) or less for solids when spilled in water) and large spills (more than 208 litres (55 US gallons) for liquids and more than 300 kilograms (660 pounds) for solids when spilled in water) for all highlighted materials. For entries marked (when used as a weapon) volumes vary, but in most cases, small spills include releases up to 2 kg (4.4 lbs), and large spills include releases up to 25 kg (55 lbs).

Within the initial isolation distance is a distance within which all persons should be considered for evacuation in all directions from the actual spill/leak source. It is a distance (radius) which defines a circle (Initial Isolation Zone) within which persons may be exposed to dangerous concentrations upwind of the source and may be exposed to life-threatening concentrations downwind of the source.

The protective action distance are downward distances from the spill or leak source within which responders could carry out protective actions to:

- preserve the health and safety of emergency responders and the public
- Evacuate and/or shelter in place people in this area (for more information consult pages 288 - 290)

The protective action distances are divided into daytime and nighttime incidents because varying atmospheric conditions affect the size of the hazardous area size. In fact, the quantity or concentration of the material’s vapour poses problems, not its mere presence. During the night, the air is generally calmer and this causes the material to disperse less and therefore create a toxic zone which is greater than would usually occur during the day. During the day, a more active atmosphere will cause a greater dispersion of the material resulting in a lower concentration of the material in the surrounding air. The actual area where toxic levels are reached is smaller (due to increased dispersion). Daytime is after sunrise and before sunset. Nighttime is between sunset and sunrise.

For example, in the case of a small spill of UN1955-compressed gas, toxic, n.o.s., the isolation distance is 100 metres (300 feet), therefore, its initial isolation zone is 200 metres (600 feet) in diameter. Its protective action distance is 0.5 kilometres (0.3 miles) for a daytime incident and 2.5 kilometres (1.6 miles) for a nighttime incident.

Note 1: Some water-reactive materials have 2 entries in Table 1. They are identified by (when spilled on land) since they are TIH products and (when spilled in water) because they produce additional toxic gases when spilled in water.

For example: UN1746 - Bromine trifluoride and UN1836 - Thionyl chloride.

Note 2: If a water-reactive material only has one entry in Table 1 for (when spilled in water) and the product is NOT spilled in water, Table 1 and Table 2 do not apply. You will find safe distances in the appropriate orange-bordered guide.

For example: UN1183 - Ethyldichlorosilane and UN1898 - Acetyl iodide.
Table 2 Water-Reactive Materials which produce toxic gases lists, by UN number order, materials that produce large amounts of Toxic Inhalation Hazard (TIH) gases when spilled in water and identifies the TIH gases produced. These Water Reactive materials are easily identified in Table 1 as their name is immediately followed by (when spilled in water).

NOTE: The TIH gases indicated in Table 2 are for information purposes only. These TIH gases have already been taken into account in the distances of Table 1. For example, Table 2 indicates that UN1689 sodium cyanide, when spilled in water, will generate hydrogen cyanide gas (HCN). In Table 1, you must refer to the distances for sodium cyanide, solid and not the distances for hydrogen cyanide gas.

Table 3 Initial isolation and protective action distances for large spills for different quantities of six common TIH gases. The selected materials are:
- UN1005 - Ammonia, anhydrous
- UN1017 - Chlorine
- UN1040 - Ethylene oxide and UN1040 Ethylene oxide with nitrogen
- UN1050 - Hydrogen chloride, anhydrous and UN2186 - Hydrogen chloride, refrigerated liquid
- UN1052 - Hydrogen fluoride, anhydrous
- UN1079 - Sulfur dioxide/Sulphur dioxide

The table provides Initial Isolation and Protective Action Distances for large spills (more than 208 litres or 55 US gallons) involving different container types (therefore different volume capacities) for day-time and night-time situations and different wind speeds.
How to choose the appropriate isolation and protective action distances

ANZ-ERG2021 lists the isolation or evacuation in 2 places: The individual guides (orange-bordered pages) and in the Table 1 - Initial Isolation and Protective Action Distances (green-bordered pages).

If you are dealing with a non-TIH (PIH in the US) (not highlighted in green in the yellow bordered or blue bordered pages), go to the assigned guide. Under EVACUATION you will find: initial isolation distance as an immediate precautionary measure. Specific distances for spill or fire situations (fragment hazard). Please note that certain guides may also refer to Table 1. This is just a reminder for green highlighted materials only.

If you are dealing with a TIH, water-reactive or chemical warfare material (green highlighted entries in the yellow or blue bordered pages):
If there is no fire go directly to Table 1 - Initial Isolation and Protective Action Distances (green-bordered pages) and consult the assigned guide the material (orange-bordered pages).
If a fire is involved go directly to the assigned guide (orange-bordered pages) and apply the distances found under EVACUATION- Fire and consult Table 1 distances for residual material release.
PROTECTIVE CLOTHING

**Street Clothing and Work Uniforms.** These garments, such as uniforms worn by police and emergency medical services personnel, provide almost no protection from the harmful effects of dangerous goods.

**Structural Fire Fighters Protective Clothing (SFPC).** This category of clothing, often called turnout or bunker gear, means the protective clothing normally worn by fire fighters during structural fire fighting operations. It includes a helmet, coat, pants, boots, gloves and a hood to cover parts of the head not protected by the helmet and facepiece. This clothing must be used with full-facepiece positive pressure self-contained breathing apparatus (SCBA). This protective clothing should, at a minimum, meet the AS/NZS ISO 2801:2008 and AS/NZS 4967:2009. Structural fire fighters protective clothing provides limited protection from heat and cold. It may not provide adequate protection from the harmful vapours or liquids that are encountered during dangerous goods incidents. Each guide includes a statement about the use of SFPC in incidents involving those materials referenced by that guide. Some guides state that SFPC provides limited protection. In those cases, the responder wearing SFPC and SCBA may be able to perform an expedient, that is quick in-and-out, operation. However, this type of operation can place the responder at risk of exposure, injury or death. The incident controller makes the decision to perform this operation only if an overriding benefit can be gained (i.e., perform an immediate rescue, turn off a valve to control a leak, etc.). The overall-type protective clothing customarily worn to fight fires in forests or bushland is not SFPC and is not recommended nor referred to elsewhere in this guidebook.

**Positive Pressure Self-Contained Breathing Apparatus (SCBA).** This apparatus provides a constant, positive pressure flow of air within the facepiece. SCBA should, at a minimum, meet the AS/NZS 1715:2009 and AS/NZS 1716:2012. Chemical-cartridge respirators or other filtering masks are not acceptable substitutes for positive pressure self-contained breathing apparatus. The three most common Air Purifying Respirators (ARPS) are P2, P3 and Powered Air Purifying Respirators (PAPR.) Consult your organisational policy and procedure before considering their use.

Chemical Protective Clothing and Equipment. Safe use of this type of protective clothing and equipment requires specific skills developed through training and experience. These chemical suits should at a minimum, meet AS/NZS ISO 6529:2006.

This type of special clothing may protect against one chemical but be readily permeated by chemicals for which it was not designed. Therefore, protective clothing should not be used unless it is compatible with the released material. This type of special clothing offers little or no protection against heat and/or cold. Examples of this type of equipment have been described as (1) Gas Tight Chemical Protective Suit (EN 943-1:2002) Level A protection and (2) Protective clothing against liquid chemicals (EN 14605:2005) is sometimes referred to as Level B or C protection. No single protective clothing material will protect you from all dangerous goods. Do not assume any protective clothing is resistant to cold and/or heat or flame exposure unless it is so certified by the manufacturer. Consult glossary for additional protection levels under the heading Protective Clothing.
Standards referenced in the section

Structural Firefighters Protective Clothing:

AS/NZS ISO 2801:2008 - Clothing for protection against heat and flame
   General recommendations for selection, care and use of protective clothing

AS/NZS 4967:2009 - Protective clothing for firefighters Requirements and test methods
   for protective clothing used for structural firefighting

Positive Pressure Self-Contained Breathing Apparatus (SCBA):

AS/NZS 1715:2009 - Selection, use and maintenance of respiratory protective equipment
AS/NZS 1716:2012 - Respiratory protective devices

Chemical Protective Clothing and Equipment:

AS/NZS ISO 6529:2006 - Protective clothing Protection against chemicals
   Determination of resistance of protective clothing materials to permeation by liquids and
gases
EN943-1:2002   Protective clothing against dangerous solid, liquid and gaseous
   chemicals including liquid and solid aerosols- Part 1: performance requirements for type 1
   (gas-tight) chemical protective suits.
EN14605:2005   Protective clothing against liquid chemicals: performance requirements
   for clothing with liquid tight (Type 3) or spray tight (Type 4) connections, including items
   protection to parts of the body only (Types PB 3 and PB 4)
DECONTAMINATION

The ways to decontaminate people and equipment can vary. If you need help with decontamination, contact the emergency response telephone number provided on the transport documents or the appropriate emergency service. These resources may be able to put you in contact with the chemical manufacturer to determine the appropriate procedure if not otherwise available.

Decontamination is the process of removing or neutralising hazardous materials/dangerous goods that have contaminated people and equipment during an incident. Contamination happens in the area generally referred to as the Hot Zone. Everything and everyone entering this zone should be decontaminated when leaving, including emergency response personnel. This reduces the chances that more contamination will occur.

There are two main types of contamination:
- **Direct contamination** happens in the Hot Zone.
- **Cross contamination** happens when someone or something outside the Hot Zone was not properly decontaminated and comes in contact with another object or person, usually in the Warm or Cold Zone.

To decontaminate, you must: physically remove contaminants and/or chemically neutralise contaminants.

The NFPA, describes the following four kinds of decontamination:
1. **Gross decontamination**: quickly removing surface contamination, which usually happens by mechanically removing the contaminant or rinsing with water from handheld hose lines, emergency showers, or other nearby water sources.
2. **Technical decontamination**: Reducing contamination to a level as low as possible by chemical or physical methods. A hazmat team will perform this kind of decontamination.
3. **Mass decontamination**: Reducing or removing surface contaminants as fast as possible from a large number of people in potentially life-threatening situations.
4. **Emergency decontamination**: Immediately reducing contamination of people in potentially life-threatening situations with or without formally setting up a decontamination corridor. This process should be performed upwind and uphill from victims. Responders should avoid contact with victims, runoff or spray from the decontamination process.

Emergency and mass decontamination can be done with firefighting and rescue operations equipment. Nozzles can be put on wide-angle fog patterns and sprayed towards the ground to create a decontamination shower. Responders can also place nozzles on the discharge ports of engines.

Contaminated clothing and equipment must be removed after use and stored in a controlled area (Warm Zone) until cleanup procedures can begin. Sometimes protective clothing and equipment cannot be decontaminated and must be disposed of properly.

Chemical neutralisation releases heat. Do not perform on a victim.
FIRE AND SPILL CONTROL

FIRE CONTROL
Water is the most common and generally most available fire extinguishing agent. Exercise caution in selecting a fire extinguishing method since there are many factors to be considered in an incident. Water may be ineffective in fighting fires involving some materials.

Fires involving a spill of flammable liquids are generally controlled by applying a fire fighting foam to the surface of the burning material. Fighting flammable liquid fires requires foam concentrate which is chemically compatible with the burning material, correct mixing of the foam concentrate with water and air, and careful application and maintenance of the foam blanket. There are two general types of fire fighting foam: regular and alcohol-resistant. Examples of regular foam are protein-base, fluoroprotein, and aqueous film-forming foam (AFFF). Some flammable liquids, including many petroleum products, can be controlled by applying regular foam. Other flammable liquids, including polar solvents (flammable liquids which are water soluble) such as alcohols and ketones, have different chemical properties. A fire involving these materials cannot be easily controlled with regular foam and requires application of alcohol-resistant foam. Polar solvent fires may be difficult to control and require a higher foam application rate than other flammable liquid fires (see NFPA Standard 11 for further information). Refer to the appropriate guide to determine which type of foam is recommended. Although it is impossible to make specific recommendations for flammable liquids which have subsidiary corrosive or toxic hazards, alcohol-resistant foam may be effective for many of these materials. The emergency response telephone number on the transport document, or the appropriate emergency response agency, should be contacted as soon as possible for guidance on the proper fire extinguishing agent to use. The final selection of the agent and method depends on many factors such as incident location, exposure hazards, size of the fire, environmental concerns, as well as the availability of extinguishing agents and equipment at the scene.

Contact the emergency response telephone number provided on the transport documents or the appropriate emergency service, as soon as possible for guidance on the proper fire extinguishing agent to use.

WATER REACTIVE MATERIALS
Water is sometimes used to flush spills and to reduce or direct vapours in spill situations. Some of the materials covered by the guidebook can react violently or even explosively with water. In these cases, consider letting the fire burn or leaving the spill alone (except to prevent its spreading by diking) until additional technical advice can be obtained.

The applicable guides clearly warn you of these potentially dangerous reactions. These materials require technical advice since:

(1) water getting inside a ruptured or leaking container may cause an explosion
(2) water may be needed to cool adjoining containers to prevent their rupturing (exploding) or further spread of the fires
(3) Water may be effective in mitigating an incident involving a water-reactive material only if it can be applied at a sufficient flooding rate for an extended period; and

(4) The products from the reaction with water may be more toxic, corrosive, or otherwise more undesirable than the product of the fire without water applied.

When responding to an incident involving water-reactive materials, take into account the existing conditions such as wind, precipitation, location and accessibility to the incident, as well as the availability of the agents to control the fire or spill. Because there are variables to consider, the decision to use water on fires or spills involving water-reactive materials should be based on information from an authoritative source for example, a producer of the material, who can be contacted through the emergency response telephone number or the appropriate emergency response agency.

VAPOUR CONTROL

Limiting the amount of vapour released from a pool of flammable or corrosive liquids is an operational concern. It requires the use of proper protective clothing, specialized equipment, appropriate chemical agents, and skilled personnel. Before engaging in vapour control, get advice from an authoritative source as to the proper tactics. There are several ways to minimize the amount of vapours escaping from pools of spilled liquids, such as special foams, adsorbing agents, absorbing agents, and neutralising agents. To be effective, these vapour control methods must be selected for the specific material involved and performed in a manner that will mitigate, not worsen, the incident.

Where specific materials are known, such as at manufacturing or storage facilities, it is desirable for the dangerous goods response team to prearrange with the facility operators to select and stockpile these control agents in advance of a spill. In the field, first responders may not have the most effective vapour control agent for the material available. They are likely to have only water and only one type of fire fighting foam on their vehicles. If the available foam is inappropriate for use, they are likely to use water spray. Because the water is being used to form a vapour seal, care must be taken not to churn or further spread the spill during application. Vapours that do not react with water may be directed away from the site using the air currents surrounding the water spray. Before using water spray or other methods to safely control vapour emission or to suppress ignition, obtain technical advice, based on specific chemical name identification.
BLEVE (Boiling Liquid Expanding Vapour Explosion)

The following section presents, in a two-page format, background information on BLEVEs and includes a chart that provides important safety-related information to consider when confronted with this type of situation involving Liquefied Petroleum Gases (LPG), UN1075. LPGs include the following flammable gases: Butane, UN1011 Butylene, UN1012 Isobutylene, UN1055 Propylene, UN1077 Isobutane, UN1969 and Propane, UN1978.

A BLEVE occurs when a fire impinged, or damaged tank car fails to contain its internal pressure and explodes with a sudden pressure release. This catastrophic failure is more likely to occur with damaged pressure tank cars, even in the absence of an active fire.

**What are the main hazards from a BLEVE**

The main hazards from a propane or LPG BLEVE are:
- Fire: if the released substance is ignited there is an immediate fireball.
- Thermal radiation: at a distance of about 4 times the radius of a fireball, the heat radiated from a fireball is enough to burn exposed skin in 2 seconds. Wearing protective clothing limits the thermal radiation dose.
- Blast: A concussive force caused by the sudden release of the pressurized substance. For a BLEVE occurring out in the open, the blast strength at a distance of 4 times the radius of a fireball can break window glass and may cause minor damage to buildings.
- Projectiles: tank failure metal fragments over large distances. These fragments can and have been deadly.

The danger from these decreases as you move away from the BLEVE centre. The furthest reaching hazard is projectiles.

For a video with information on critical safety issues concerning BLEVEs, please visit http://www.tc.gc.ca/eng/tdg/publications-menu-1238.html. This video can be viewed directly on the website. To order a DVD copy of the video, contact us by email at: TDG-RD-TMD tc.gc.ca.

**HEAT INDUCED TEAR (HIT)**

A heat induced tear (HIT) is a rupture of a NON-PRESSURE tank car containing flammable liquids when exposed to the intense heat of a fire. The metal will soften and the pressure in the tank car will increase which can lead to containment failure. The tear generally occurs at the vapor space (upper side) of the container, venting large quantities of flammable liquid and vapors at high speed. A fireball and an intense heat wave will occur.

Compared to BLEVEs, HITs rarely result in the projection of tank car fragments. Heat induced tearing has occurred within 20 minutes of the derailment and as long as 10 hours following the initial fire.

Responding to these types of incidents (BLEVE and HIT) requires specialized training, equipment and a tactical approach.
BLEVE – SAFETY PRECAUTIONS

Use with caution. The following table gives a summary of tank properties, critical times, critical distances and cooling water flow rates for various tank sizes. This table is provided to give responders some guidance but it should be used with caution.

Tank dimensions are approximate and can vary depending on the tank design and application.

Minimum time to failure is based on severe torch fire impingement on the vapour space of a tank in good condition, and is approximate. Tanks may fail earlier if they are damaged or corroded. Tanks may fail minutes or hours later than these minimum times depending on the conditions. It has been assumed here that the tanks are not equipped with thermal barriers or water spray cooling.

Minimum time to empty is based on an engulfing fire with a properly sized pressure relief valve. If the tank is only partially engulfed, then time to empty will increase (i.e., if tank is 50% engulfed, then the tanks will take twice as long to empty). Once again, it has been assumed that the tank is not equipped with a thermal barrier or water spray.

Tanks equipped with thermal barriers or water spray cooling significantly increase the times to failure and the times to empty. A thermal barrier can reduce the heat input to a tank by a factor of ten or more. This means it could take ten times as long to empty the tank through the Pressure Relief Valve (PRV).

Fireball radius and emergency response distance is based on mathematical equations and is approximate. They assume spherical fireballs and this is not always the case.

Two safety distances for public evacuation. The minimum distance is based on tanks that are launched with a small elevation angle (i.e., a few degrees above horizontal). This is most common for horizontal cylinders. The preferred evacuation distance has more margin of safety since it assumes the tanks are launched at a 45 degree angle to the horizontal. This might be more appropriate if a vertical cylinder is involved.

It is understood that these distances are very large and may not be practical in a highly populated area. However, it should be understood that the risks increase rapidly the closer you are to a BLEVE. Keep in mind that the furthest reaching projectiles tend to come off in the zones 45 degrees on each side of the tank ends.

Water flow rate is based on $9.75 \sqrt{\text{capacity (litres)}} = \text{litres/min needed to cool tank metal}.$

Warning: the data given are approximate and should only be used with extreme caution. For example, where times are given for tank failure or tank emptying through the pressure relief valve – these times are typical but they can vary from situation to situation. Therefore, never risk life based on these times.
The data given are approximate and should only be used with extreme caution. These times can vary from situation to situation. LPG tanks have been known to BLEVE within minutes. Therefore, never risk life based on these times.

**BLEVE**
(USE WITH CAUTION)

<table>
<thead>
<tr>
<th>Capacity (Litres)</th>
<th>Diameter (metres)</th>
<th>Length (metres)</th>
<th>Propane Mass (Kilograms)</th>
<th>Minimum time to failure for severe torch (Minutes)</th>
<th>Approximate time to empty for engulfing fire (Minutes)</th>
<th>Fireball radius (metres)</th>
<th>Emergency response distance (metres)</th>
<th>Minimum evacuation distance (metres)</th>
<th>Preferred evacuation distance (metres)</th>
<th>Cooling water flow rate (Litres/min)</th>
<th>Cooling water flow rate (USgal/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 (26.4)</td>
<td>0.3 (1)</td>
<td>1.5 (4.9)</td>
<td>40 (88)</td>
<td>4</td>
<td>8</td>
<td>10 (33)</td>
<td>90 (295)</td>
<td>154 (505)</td>
<td>307 (1007)</td>
<td>97</td>
<td>26</td>
</tr>
<tr>
<td>400 (106)</td>
<td>0.61 (2)</td>
<td>1.5 (4.9)</td>
<td>160 (353)</td>
<td>4</td>
<td>12</td>
<td>16 (53)</td>
<td>90 (295)</td>
<td>244 (801)</td>
<td>488 (1601)</td>
<td>195</td>
<td>51</td>
</tr>
<tr>
<td>2000 (528)</td>
<td>0.96 (3.2)</td>
<td>3 (9.8)</td>
<td>800 (1764)</td>
<td>5</td>
<td>18</td>
<td>28 (92)</td>
<td>111 (364)</td>
<td>417 (1368)</td>
<td>834 (2736)</td>
<td>435</td>
<td>115</td>
</tr>
<tr>
<td>4000 (1057)</td>
<td>1 (3.3)</td>
<td>4.9 (16.1)</td>
<td>1600 (3527)</td>
<td>5</td>
<td>20</td>
<td>35 (115)</td>
<td>140 (459)</td>
<td>525 (1722)</td>
<td>1050 (3445)</td>
<td>615</td>
<td>163</td>
</tr>
<tr>
<td>8000 (2113)</td>
<td>1.25 (4.1)</td>
<td>6.5 (21.3)</td>
<td>3200 (7055)</td>
<td>6</td>
<td>22</td>
<td>44 (144)</td>
<td>176 (577)</td>
<td>661 (2169)</td>
<td>1323 (4341)</td>
<td>870</td>
<td>230</td>
</tr>
<tr>
<td>22000 (5812)</td>
<td>2.1 (6.9)</td>
<td>6.7 (22)</td>
<td>8800 (19400)</td>
<td>7</td>
<td>28</td>
<td>62 (203)</td>
<td>247 (810)</td>
<td>926 (3038)</td>
<td>1852 (6076)</td>
<td>1443</td>
<td>381</td>
</tr>
<tr>
<td>42000 (11095)</td>
<td>2.1 (6.9)</td>
<td>11.8 (38.7)</td>
<td>16800 (37037)</td>
<td>7</td>
<td>32</td>
<td>77 (253)</td>
<td>306 (1004)</td>
<td>1149 (3770)</td>
<td>2200 (7218)</td>
<td>1994</td>
<td>527</td>
</tr>
<tr>
<td>82000 (21662)</td>
<td>2.75 (9)</td>
<td>13.7 (45)</td>
<td>32800 (72310)</td>
<td>8</td>
<td>40</td>
<td>96 (315)</td>
<td>383 (1257)</td>
<td>1435 (4708)</td>
<td>2200 (7218)</td>
<td>2786</td>
<td>736</td>
</tr>
<tr>
<td>140000 (36984)</td>
<td>3.3 (10.8)</td>
<td>17.2 (56.4)</td>
<td>56000 (123457)</td>
<td>9</td>
<td>45</td>
<td>114 (374)</td>
<td>457 (1499)</td>
<td>1715 (5627)</td>
<td>2200 (7218)</td>
<td>3640</td>
<td>962</td>
</tr>
</tbody>
</table>
## Improvised Explosive Device (IED)

### SAFE STAND-OFF DISTANCE

<table>
<thead>
<tr>
<th>Threat Description</th>
<th>Explosives Capacity&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Mandatory Evacuation Distance&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Shelter-in-Place Zone</th>
<th>Preferred Evacuation Distance&lt;sup&gt;3&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Explosives (TNT Equivalent)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipe Bomb</td>
<td>5 lbs 2.3 kg</td>
<td>70 ft 21 m</td>
<td>71 - 1,199 ft 22 - 365 m</td>
<td>+1,200 ft 366 m</td>
</tr>
<tr>
<td>Suicide Bomber</td>
<td>20 lbs 9 kg</td>
<td>110 ft 34 m</td>
<td>111 - 1,699 ft 35 - 518 m</td>
<td>+1,700 ft 519 m</td>
</tr>
<tr>
<td>Briefcase/Suitcase</td>
<td>50 lbs 23 kg</td>
<td>150 ft 46 m</td>
<td>151 - 1,849 ft 47 - 563 m</td>
<td>+1,850 ft 564 m</td>
</tr>
<tr>
<td>Car</td>
<td>500 lbs 227 kg</td>
<td>320 ft 98 m</td>
<td>321 - 1,899 ft 99 - 579 m</td>
<td>+1,900 ft 580 m</td>
</tr>
<tr>
<td>SUV/Van</td>
<td>1,000 lbs 454 kg</td>
<td>400 ft 122 m</td>
<td>401 - 2,399 ft 123 - 731 m</td>
<td>+2,400 ft 732 m</td>
</tr>
<tr>
<td>Small Delivery Truck</td>
<td>4,000 lbs 1,814 kg</td>
<td>640 ft 195 m</td>
<td>641 - 3,799 ft 196 - 1,158 m</td>
<td>+3,800 ft 1,159 m</td>
</tr>
<tr>
<td>Container/Water Truck</td>
<td>10,000 lbs 4,536 kg</td>
<td>860 ft 263 m</td>
<td>861 - 5,099 ft 264 - 1,554 m</td>
<td>+5,100 ft 1,555 m</td>
</tr>
<tr>
<td>Semi-Trailer</td>
<td>60,000 lbs 27,216 kg</td>
<td>1,570 ft 475 m</td>
<td>1,571 - 9,299 ft 476 - 2,834 m</td>
<td>+9,300 ft 2,835 m</td>
</tr>
</tbody>
</table>

<sup>1</sup> Based on the maximum amount of material that could reasonably fit into a container or vehicle. Variations possible.

<sup>2</sup> Governed by the ability of an unreinforced building to withstand severe damage or collapse.

<sup>3</sup> Governed by the greater of fragment throw distance or glass breakage/falling glass hazard distance. These distances can be reduced for personnel wearing ballistic protection. Note that the pipe bomb, suicide bomb, and briefcase/suitcase bomb are assumed to have a fragmentation characteristic that requires greater stand-off distances than an equal amount of explosives in a vehicle.
<table>
<thead>
<tr>
<th>Threat Description</th>
<th>LPG Mass / Volume¹</th>
<th>Fireball Diameter²</th>
<th>Safe Distance³, ⁴</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small LPG Tank</td>
<td>20 lbs / 5 gal</td>
<td>9 kg / 19 L</td>
<td>40 ft 12 m</td>
</tr>
<tr>
<td>Large LPG Tank</td>
<td>100 lbs / 25 gal</td>
<td>45 kg / 95 L</td>
<td>69 ft 21 m</td>
</tr>
<tr>
<td>Commercial/Residential LPG Tank</td>
<td>2,000 lbs / 500 gal</td>
<td>907 kg / 1,893 L</td>
<td>184 ft 56 m</td>
</tr>
<tr>
<td>Small LPG Truck</td>
<td>8,000 lbs / 2,000 gal</td>
<td>3,630 kg / 7,570 L</td>
<td>292 ft 89 m</td>
</tr>
<tr>
<td>Semitanker LPG</td>
<td>40,000 lbs / 10,000 gal</td>
<td>18,144 kg / 37,850 L</td>
<td>499 ft 152 m</td>
</tr>
</tbody>
</table>

¹ Based on the maximum amount of LPG that could reasonably fit into a container or vehicle. Variations possible.
² Assuming efficient mixing of the flammable gas with ambient air.
³ Determined by U.S. firefighting practices wherein safe distances are approximately 4 times the flame height.
⁴ This table is for a loaded LPG tank with explosives on the exterior. Note that an LPG tank filled with high explosives would require a significantly greater stand-off distance than if it were filled with LPG.
GLOSSARY

Adsorbed gas
A gas which sticks (adsorbs) to the surface of a solid and porous material (such as activated charcoal) contained within a metal cylinder. This results in an internal cylinder pressure of less than 101.3 kPa at 20 °C (14 psi at 68 °F) and less than 300 kPa at 50 °C (43 psi at 122 °F). These pressures are much lower than those of conventional cylinders containing compressed or liquified gases.

AEGL(s)
Acute Exposure Guideline Level(s), AEGLs represent threshold exposure limits for the general public after a once-in-a-lifetime, or rare, exposure and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. Three levels AEGL-1, AEGL-2 and AEGL-3 are developed for each of five exposure periods (10 and 30 minutes, 1 hour, 4 hours, and 8 hours) and are distinguished by varying degrees of severity of toxic effects; see AEGL-1, AEGL-2 and AEGL-3.

AEGL-1
AEGL-1 is the airborne concentration (expressed as parts per million or milligrams per cubic meter [ppm or mg/m³]) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic, non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2
AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3
AEGL-3 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

Alcohol-resistant foam
A foam that is resistant to “polar” chemicals such as ketones and esters which may break down other types of foam.

Biological agents
Living organisms that cause disease, sickness and mortality in humans. Anthrax and Ebola are examples of biological agents. Refer to GUIDE 158.

Blister agents (vesicants)
Substances that cause blistering of the skin. Exposure is through liquid or vapour contact with any exposed tissue (eyes, skin, lungs). Mustard (H), Distilled Mustard (HD), Nitrogen Mustard (HN) and Lewisite (L) are blister agents.

Symptoms: Red eyes, skin irritation, burning of skin, blisters, upper respiratory damage, cough, hoarseness.
GLOSSARY

Blood agents: Substances that injure a person by interfering with cell respiration (the exchange of oxygen and carbon dioxide between blood and tissues). Hydrogen cyanide (AC) and Cyanogen chloride (CK) are blood agents. Symptoms: Respiratory distress, headache, unresponsiveness, seizures, coma.

Boil over: A sudden increase in fire intensity associated with the expulsion of burning flammable liquid caused by the boiling of water that has accumulated in the bottom of a tank car.

Burn: Refers to either a chemical or thermal burn, the former may be caused by corrosive substances and the latter by liquefied cryogenic gases, hot molten substances, or flames.

Carcinogen: A substance or mixture which induces cancer or increases its incidence.

Category A: An infectious substance that poses a high risk to the health of individuals and/or animals or public health. These substances can cause serious disease and can lead to death. Effective treatment and preventative measures may not be available.

Category B: An infectious substance that poses a low to moderate risk to individuals and/or animals and/or public health. These substances are unlikely to cause serious disease. Effective treatment and preventative measures are available.

CBRN: Chemical, biological, radiological or nuclear warfare agent.

Choking agents: Substances that cause physical injury to the lungs. Exposure is through inhalation. In extreme cases, membranes swell and lungs become filled with liquid (pulmonary edema). Death results from lack of oxygen; hence, the victim is “choked”. Phosgene (CG) is a choking agent.

Symptoms: Irritation to eyes/nose/throat, respiratory distress, nausea and vomiting, burning of exposed skin.

CO₂: Carbon dioxide gas.

Cold zone: Area where the command post and support functions that are necessary to control the incident are located. This is also referred to as the clean zone, green zone or support zone in other documents. (EPA Standard Operating Safety Guidelines, OSHA 29 CFR 1910.120, NFPA 472).

Combustible liquid: Any liquid that has a flash point greater than 60.5°C, and has a fire point that is less than its boiling point.
Glossary

Compatibility Group

Letters identify explosives that are deemed to be compatible. The definition of these Compatibility Groups in this Glossary are intended to be descriptive. Please consult the transportation of dangerous goods/hazardous materials or explosives regulations of your jurisdiction for the exact wording of the definitions. Class 1 materials are considered to be “compatible” if they can be transported together without significantly increasing either the probability of an incident or, for a given quantity, the magnitude of the effects of such an incident.

A Substances which are expected to mass detonate very soon after fire reaches them.
B Articles which are expected to mass detonate very soon after fire reaches them.
C Substances or articles which may be readily ignited and burn violently without necessarily exploding.
D Substances or articles which may mass detonate (with blast and/or fragment hazard) when exposed to fire.
E & F Articles which may mass detonate in a fire.
G Substances and articles which may mass explode and give off smoke or toxic gases.
H Articles which in a fire may eject hazardous projectiles and dense white smoke.
J Articles which may mass explode.
K Articles which in a fire may eject hazardous projectiles and toxic gases.
L Substances and articles which present a special risk and could be activated by exposure to air or water.
N Articles which contain only extremely insensitive detonating substances and demonstrate a negligible probability of accidental ignition or propagation.
S Packaged substances or articles which, if accidentally initiated, produce effects that are usually confined to the immediate vicinity.
GLOSSARY

Control zones  Designated areas at dangerous goods incidents, based on safety and the degree of hazard. Many terms are used to describe control zones; however, in this guidebook, these zones are defined as the hot/exclusion/red/restricted zone, warm/contamination reduction/yellow/limited access zone, and cold/support/green/clean zone. (EPA Standard Operating Safety Guidelines, OSHA 29 CFR 1910.120, NFPA 472).

Cryogenic liquid  A refrigerated, liquefied gas that has a boiling point colder than -90°C (-130°F) at atmospheric pressure.

Decomposition products  Products of a chemical or thermal break-down of a substance.

Decontamination  The removal of dangerous goods from personnel and equipment to the extent necessary to prevent potential adverse health effects. Always avoid direct or indirect contact with dangerous goods; however, if contact occurs, personnel should be decontaminated as soon as possible. Since the methods used to decontaminate personnel and equipment differ from one chemical to another, contact the chemical manufacturer to determine the appropriate procedure. Contaminated clothing and equipment should be removed after use and stored in a controlled area (warm/contamination reduction/yellow/limited access zone) until cleanup procedures can be initiated. In some cases, protective clothing and equipment cannot be decontaminated and must be disposed of in a proper manner.

Dry chemical  A preparation designed for fighting fires involving flammable liquids, pyrophoric substances and electrical equipment. Common types contain sodium bicarbonate or potassium bicarbonate.

Edema  The accumulation of an excessive amount of watery fluid in cells and tissues. Pulmonary edema is an excessive build up of water in the lungs, for instance, after inhalation of a gas that is corrosive to lung tissue.

ERPG(s)  Emergency Response Planning Guideline(s). Values intended to provide estimates of concentration ranges above which one could reasonably anticipate observing adverse health effects; see ERPG-1, ERPG-2 and ERPG-3.
GLOSSARY

ERPG-1
The maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing more than mild, transient adverse health effects or without perceiving a clearly defined objectionable odour.

ERPG-2
The maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair an individual’s ability to take protective action.

ERPG-3
The maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.

Flammable liquid
A liquid that has a flash point of 60°C (140°F) or lower.

Flash point
Lowest temperature at which a liquid or solid gives off vapour in such a concentration that, when the vapour combines with air near the surface of the liquid or solid, a flammable mixture is formed. Hence, the lower the flash point, the more flammable the material.

Flooding quantities
Minimum of 1900 L/min (500 US gal/min) of water.

Hazard zones (Inhalation Hazard Zones)

HAZARD ZONE A: Gases: LC50 of less than or equal to 200 ppm, Liquids: V equal to or greater than 500 LC50 and LC50 less than or equal to 200 ppm,

HAZARD ZONE B: Gases: LC50 greater than 200 ppm and less than or equal to 1000 ppm, Liquids: V equal to or greater than 10 LC50; LC50 less than or equal to 1000 ppm and criteria for Hazard Zone A are not met.

HAZARD ZONE C: LC50 greater than 1000 ppm and less than or equal to 3000 ppm,

HAZARD ZONE D: LC50 greater than 3000 ppm and less than or equal to 5000 ppm.

High expansion foam
Foams that have a high expansion ratio (over 1:200) with a low water content.
**GLOSSARY**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot zone</td>
<td>Area immediately surrounding a dangerous goods incident which extends far enough to prevent adverse effects from released dangerous goods to personnel outside the zone. This zone is also referred to as exclusion zone, red zone or restricted zone in other documents. (EPA Standard Operating Safety Guidelines, OSHA 29 CFR 1910.120, NFPA 472).</td>
</tr>
<tr>
<td>IED</td>
<td>See “Improvised Explosive Device”.</td>
</tr>
<tr>
<td>Immiscible</td>
<td>In this guidebook, means that a material does not mix readily with water.</td>
</tr>
<tr>
<td>Improvised Explosive Device</td>
<td>A bomb that is manufactured from commercial, military or homemade explosives.</td>
</tr>
<tr>
<td>Large spill</td>
<td>A spill that involves quantities that are greater than 208 litres for liquids and greater than 300 kilograms for solids.</td>
</tr>
<tr>
<td>LC50</td>
<td>Lethal concentration 50. The concentration of a material administered by inhalation that is expected to cause the death of 50% of an experimental animal population within a specified time. (Concentration is reported in either ppm or mg/m³).</td>
</tr>
<tr>
<td>Mass explosion</td>
<td>Explosion which affects almost the entire load virtually instantaneously.</td>
</tr>
<tr>
<td>MAWP</td>
<td>Maximum Allowable Working Pressure: The maximum allowable internal pressure that the tank may experience during normal operations</td>
</tr>
<tr>
<td>mg/m³</td>
<td>Milligrams of a material per cubic metre of air.</td>
</tr>
<tr>
<td>Miscible</td>
<td>In this guidebook, means that a material mixes readily with water.</td>
</tr>
<tr>
<td>mL/m³</td>
<td>Millilitres of a material per cubic meter of air. (1 mL/m³ equals 1 ppm).</td>
</tr>
<tr>
<td>Mutagen</td>
<td>An agent giving rise to an increased occurrence of mutations in populations of cells and/or organisms. Mutation means a permanent change in the amount or structure of the genetic material in a cell.</td>
</tr>
<tr>
<td>Narcotic</td>
<td>A substance which acts as a central nervous system depressor producing effects such as drowsiness, narcosis, reduced alertness, loss of reflexes, lack of coordination, and vertigo. These effects can also be manifested as severe headache or nausea, and can lead to reduced judgment, dizziness, irritability, fatigue, impaired memory function, deficit in perception and coordination, reaction time, or sleepiness.</td>
</tr>
</tbody>
</table>
GLOSSARY

Nerve agents
Substances that interfere with the central nervous system. Exposure is primarily through contact with the liquid (via skin and eyes) and secondarily through inhalation of the vapour. Tabun (GA), Sarin (GB), Soman (GD) and VX are nerve agents.

Symptoms: Pinpoint pupils, extreme headache, severe tightness in the chest, dyspnea, runny nose, coughing, salivation, unresponsiveness, seizures.

n.o.s.
These letters refer to “not otherwise specified”. The entries which use this description are generic names such as “Corrosive liquid, n.o.s.” This means that the actual chemical name for that corrosive liquid is not listed in the regulations; therefore, a generic name must be used to describe it on Transport Documents.

Noxious
In this guidebook, means that a material may be harmful or injurious to health or physical well-being.

Organic Peroxide
An organic (carbon-containing) compound having two oxygen atoms joined together. Organic peroxides are thermally unstable chemicals. They may have one or more of the following properties: be liable to explosive decomposition, burn rapidly, be sensitive to impact or friction, react dangerously with other substances.

Oxidizer
A chemical which supplies its own oxygen and which helps other combustible material burn more readily.

P
See "Polymerisation".

Packing Group
The Packing Group (PG) is assigned based on the degree of danger presented by the hazardous material:

PG I : High danger
PG II : Medium danger
PG III : Low danger

PG
See "Packing Group".

pH
pH is a value that represents the acidity or alkalinity of a water solution. Pure water has a pH of 7. A pH value below 7 indicates an acid solution (a pH of 1 is extremely acidic). A pH above 7 indicates an alkaline solution (a pH of 14 is extremely alkaline). Acids and alkalis (bases) are commonly referred to as corrosive materials.

PIH
Poison Inhalation Hazard. Term used to describe gases and volatile liquids that are toxic when inhaled. (Same as TIH).

Polar
See “Miscible”.

IN AN EMERGENCY, IN AUSTRALIA CALL 000 | IN NEW ZEALAND CALL 111
**Polymerization**

A chemical reaction that often produces heat and pressure. Once initiated, the reaction is accelerated by the heat that it produces. The uncontrolled buildup of heat and pressure can cause a fire or an explosion, or can rupture closed containers. The letter (P) following a guide number in the yellow-bordered and blue-bordered pages identifies a material that may polymerise violently under high temperature conditions or contamination with other products. It is also used to identify materials that have a strong potential for polymerisation in the absence of an inhibitor due to depletion of this inhibitor caused by accident conditions.

**ppm**

Parts per million. (1 ppm equals 1 mL/m³).

**Protective clothing**

Includes both respiratory and physical protection. One cannot assign a level of protection to clothing or respiratory devices separately. These levels were accepted and defined by response organizations such as U.S. Coast Guard, NIOSH, and U.S. EPA.

- **Level A**: SCBA plus totally encapsulating chemical resistant clothing (permeation resistant).
- **Level B**: SCBA plus hooded chemical resistant clothing (splash suit).
- **Level C**: Full or half-face respirator plus hooded chemical resistant clothing (splash suit).
- **Level D**: Coverall with no respiratory protection.

**Pyrophoric**

A material which ignites spontaneously upon exposure to air (or oxygen).

**Radiation Authority**

As referred to in GUIDES 161 through 166 for radioactive materials, the Radiation Authority is either a Federal, state/territory agency or state/territory designated official. The responsibilities of this authority include evaluating radiological hazard conditions during normal operations and during emergencies.

**Radioactivity**

The property of some substances to emit invisible and potentially harmful radiation.

**Refrigerated liquid**

See “Cryogenic liquid”.

**Refrigerated liquified gas**

A gas which when packaged for transport is made partially because of its low temperature. See Cryogenic liquid.

**Respiratory sensitizer**

A substance that induces hypersensitivity of the airways following inhalation of the substance.
Shelter in-place People should seek shelter inside a building and remain inside until the danger passes. Sheltering in-place is used when evacuating the public would cause greater risk than staying where they are, or when an evacuation cannot be performed. Direct the people inside to close all doors and windows and to shut off all ventilating, heating and cooling systems. In-place protection (shelter in-place) may not be the best option if (a) the vapours are flammable; (b) it will take a long time for the gas to clear the area; or (c) if buildings cannot be closed tightly. Vehicles can offer some protection for a short period if the windows are closed and the ventilating systems are shut off. Vehicles are not as effective as buildings for in-place protection.

Skin corrosion The production of irreversible damage to the skin following the application of a test substance for up to 4 hours.

Skin irritation The production of reversible damage to the skin following the application of a test substance for up to 4 hours.

Skin sensitiser A substance that will induce an allergic response following skin contact.

Small fire A fire involving less than a surface area of 5 m² and/or less than 20 L/kg of a material, or a fire with characteristics within and not exceed the capabilities of a person other than a firefighter to safely.

Small spill A spill that involves quantities that are less than 208 litres for liquids and less than 300 kilograms for solids.

Specific gravity Weight of a substance compared to the weight of an equal volume of water at a given temperature. Specific gravity less than 1 indicates a substance is lighter than water; specific gravity greater than 1 indicates a substance is heavier than water.
GLOSSARY

Straight (solid) stream Method used to apply or distribute water from the end of a hose. The water is delivered under pressure for penetration. In an efficient straight (solid) stream, approximately 90% of the water passes through an imaginary circle 38 cm (15 inches) in diameter at the breaking point. Hose (solid or straight) streams are frequently used to cool tanks and other equipment exposed to flammable liquid fires, or for washing burning spills away from danger points. However, straight streams will cause a spill fire to spread if improperly used or when directed into open containers of flammable and combustible liquids.

TIH Toxic Inhalation Hazard. Term used to describe gases and volatile liquids that are toxic when inhaled.

Vapour concentration Saturated vapour concentration in air of a material in mL/m³ (volatility) at 20°C and standard atmospheric pressure.

Vapour density Weight of a volume of pure vapour or gas (with no air present) compared to the weight of an equal volume of dry air at the same temperature and pressure. A vapour density less than 1 (one) indicates that the vapour is lighter than air and will tend to rise. A vapour density greater than 1 (one) indicates that the vapour is heavier than air and may travel along the ground.

Vapour pressure Pressure at which a liquid and its vapour are in equilibrium at a given temperature. Liquids with high vapour pressures evaporate rapidly.

Viscosity Measure of a liquid’s internal resistance to flow. This property is important because it indicates how fast a material will leak out through holes in containers or tanks.

Warm zone Area between Hot and Cold zones where personnel and equipment decontamination and hot zone support take place. It includes control points for the access corridor and thus assists in reducing the spread of contamination. Also referred to as the contamination reduction corridor (CRC), contamination reduction zone (CRZ), yellow zone or limited access zone in other documents. (EPA Standard Operating Safety Guidelines, OSHA 29 CFR 1910.120, NFPA 472).

Water Reactive Material For the purpose of this guidebook, produces significant toxic gas when it comes in contact with water.

Water-sensitive Substances which may produce flammable and/or toxic decomposition products upon contact with water.
Water spray (fog)  Method or way to apply or distribute water. The water is finely divided to provide for high heat absorption. Water spray patterns can range from about 10 to 90 degrees. Water spray streams can be used to extinguish or control the burning of a fire or to provide exposure protection for personnel, equipment, buildings, etc. (This method can be used to absorb vapours, knock-down vapours or disperse vapours. Direct a water spray (fog), rather than a straight (solid) stream, into the vapour cloud to accomplish any of the above).

Water spray is particularly effective on fires of flammable liquids and volatile solids having flash points above 37.8°C (100°F).

Regardless of the above, water spray can be used successfully on flammable liquids with low flash points. The effectiveness depends particularly on the method of application. With proper nozzles, even gasoline spill fires of some types have been extinguished when coordinated hose lines were used to sweep the flames off the surface of the liquid. Furthermore, water spray carefully applied has frequently been used with success in extinguishing fires involving flammable liquids with high flash points (or any viscous liquids) by causing frothing to occur only on the surface, and this foaming action blankets and extinguishes the fire.
AUSTRALIAN APPROVAL
The Australian & New Zealand Emergency Response Guide (ANZ-ERG2021) is approved as emergency information satisfying the requirements of the Australian Code for the transport of Dangerous Goods by Road and Rail (ADG Code) and associated legislation. The approval was given national effect by Competent Authorities Panel decision number APP2021/114.

NEW ZEALAND APPROVAL
Supported by reference for use in New Zealand by the NZ Transport Agency - Waka Kotahi, and endorsed by the NZ chemical industry 'Responsible Care NZ', in consultation with representatives from the transport industry, logistics and freight forwarding, and the committee responsible for the NZS 5433 Transport of Dangerous Goods on Land. The ANZ-ERG is recommended for the transport of sector and emergency responders as an appropriate means to assist with initial response to a dangerous goods incident.

REPRODUCTION AND RESALE
In Australia, the ANZ-ERG2021 is available free of charge at the website of the National Transport Commission. https://www.ntc.gov.au/. In New Zealand, the ANZ-ERG2021 is available free of charge at the website of Responsible Care NZ. https://www.responsiblecarenz.com/ It may be reproduced without further permission only if the copy accurately reproduces the entire content (text, format and colouration) of this document without modification. Modified copies are not approved emergency information satisfying obligations of the ADG code and associated legislation.
IN EVERY EMERGENCY .......................................................... call 000 or 112 (Mobile)

FOR EMERGENCY SERVICES
(FIRE BRIGADE, AMBULANCE, POLICE)

Help them to help you by providing the information in the shaded box below

IN CASE OF POISONING................................................................. call 131 126

Information to provide to Emergency Services

IDENTIFICATION:
  Your name / Organisation
  Call back number / Location

EVENT:
  Deaths / Injuries
  Product(s) involved
  Quantity
  Type of vehicle / Container
  Time / Exact location
  Help: On site / To be called

OTHER HELPFUL INFORMATION:
  Consignor / Origin
  Carrier
  Consignee / Destination
  Car / Truck / Trailer / Flight No.
  Bill of Lading / Waybill No.
NEW ZEALAND

IN EVERY EMERGENCY............................................................ call 111

FOR EMERGENCY SERVICES
(FIRE BRIGADE, AMBULANCE, POLICE)
Help them to help you by providing the information in the shaded box on the previous page

IN CASE OF

POISONING ................................................................. call 0800 764 766
NATIONAL POISONS CENTRE

EMERGENCY INVOLVING
RADIOACTIVE MATERIAL ........................................call 021 393 632 (24/7)
NATIONAL RADIATION LABORATORY

OTHER CHEMICAL
EMERGENCY ..............................................call 0800 243622 (0800 CHEMCALL)
RESPONSIBLE CARE NZ - CHEMICAL EMERGENCY RESPONSE
A guidebook intended for use by first responders during the initial phase of a transportation incident involving dangerous goods/hazardous materials.

This document should not be used to determine compliance with the dangerous goods/hazardous material regulations or to create worker safety documents for specific chemicals.