



Information Sources

Hazardous Materials Advisor

Aim

By the end of the session learners will have an understanding of the common information sources available to first responders & those in the role of an HMA

Objectives

- Various Information Sources
- Structure
- Content & use
- Importance of triangulation



AGENDA

TRANSPORTATION

SUPPLY

ERG

CAMEO CHEMICALS

INTERNATIONAL CHEMICAL SAFETY CARDS

CHEMDATA

Regulations – Supply & Transport

Global Harmonised System (GHS)

UN Recommendations on TDG

EU CLP

Japan



IMO/IMDG



ICAO/IATA



RID



ADN

US

China



ADR

Transport Symbols



Explosives



Non-Flammable Gas
Non-Toxic Gas



Flammable Gas



Toxic Gas



Flammable Liquid



Dangerous
when wet



Flammable Solid



Spontaneously
Combustible

Transport Symbols



Oxidizer



Organic Peroxide



Toxic



Infectious
Substances



Radioactive



Corrosive

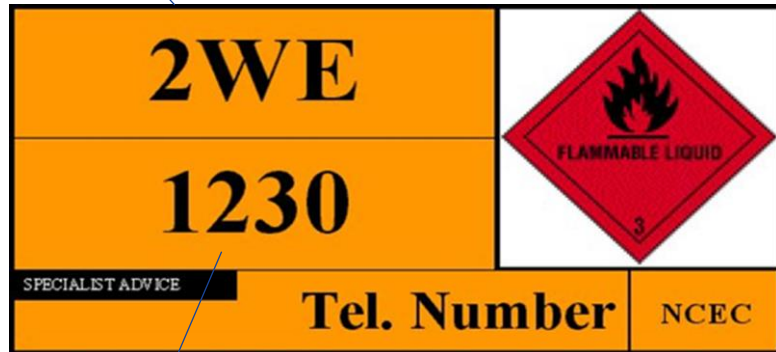


Miscellaneous

Transport – Hazchem and HIN

Hazard Identification Number

Emergency Action Code
(EAC)

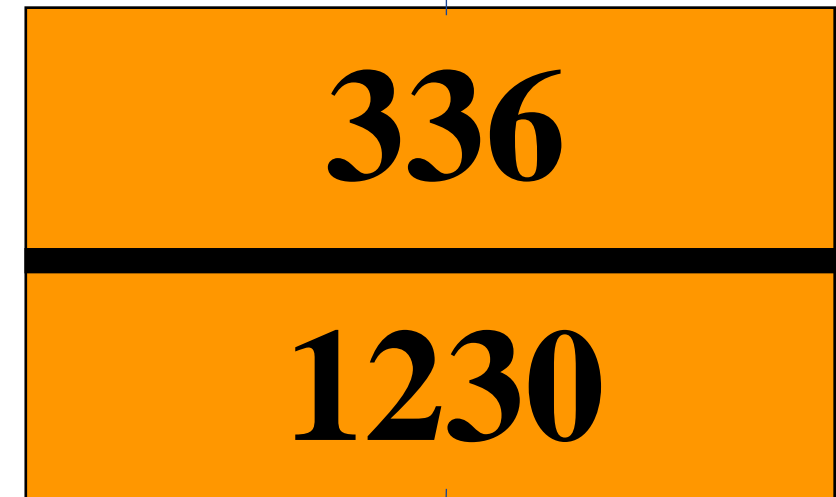


Hazard Warning
Diamond

UN Number

Emergency Telephone
Number

Supplier's Company
Logo



UN Number

Emergency Action Code & HIN

1	COARSE SPRAY	3	FOAM
2	FINE SPRAY	4	DRY AGENT
P	V	DILUTE SPILLAGE	
R			
S	V		
T		CONTAIN SPILLAGE	
W	V		
X			
Y	V	PUBLIC SAFETY HAZARD	
Z			
E			

1st Figure: Primary Hazard

2	Gas
3	Flammable liquid
4	Flammable solid
5	Oxidising substance or organic peroxide
6	Toxic
8	Corrosive

2nd & 3rd Figures: Secondary Hazard

0	No meaning
1	Explosive
2	Gas given off
3	Flammable
5	Oxidising
6	Toxic
8	Corrosive
9	Explosion from spontaneous decomposition

X33
1088

UN Identification Number

X means no water


Dangerous Goods Notes & Waste Transfer Notes

DGNs

- Haulier's documentation
- Where its come from, where its going, what it is, how much etc.
- NO hazard information
- Requirement under ADR
 - Bill of Lading (IATA/IMDG)

Waste Transfer Note

- Waste transfer notes (WTNs) are documents that track the movement of waste from one party to another



DANGEROUS GOODS NOTE

1 Customs reference/status

Booking number

3 Exporter's reference

Forwarder's reference

6 DSHA Notification (in accordance with DSHA Regulations (as amended)) given by:

Shipper

Cargo agent

Transport operator

Shipping time

7 International consignment

8

Duty of care: waste transfer note Keep this page and copy it for future use. Please write as clearly as possible.

Section A – Description of waste

A1 Description of the waste being transferred

A2 How is the waste contained?

Loose ☐ Sacks ☐ Skip ☐ Drum ☐

Other ☐

A3 How much waste? For example, number of sacks, weight

Section B – Current holder of the waste – Transferor

By signing in Section D below I confirm that I have fulfilled my duty to apply the waste hierarchy as required by Regulation 12 of the Waste (England and Wales) Regulations 2011 Yes ☐

B1 Full name

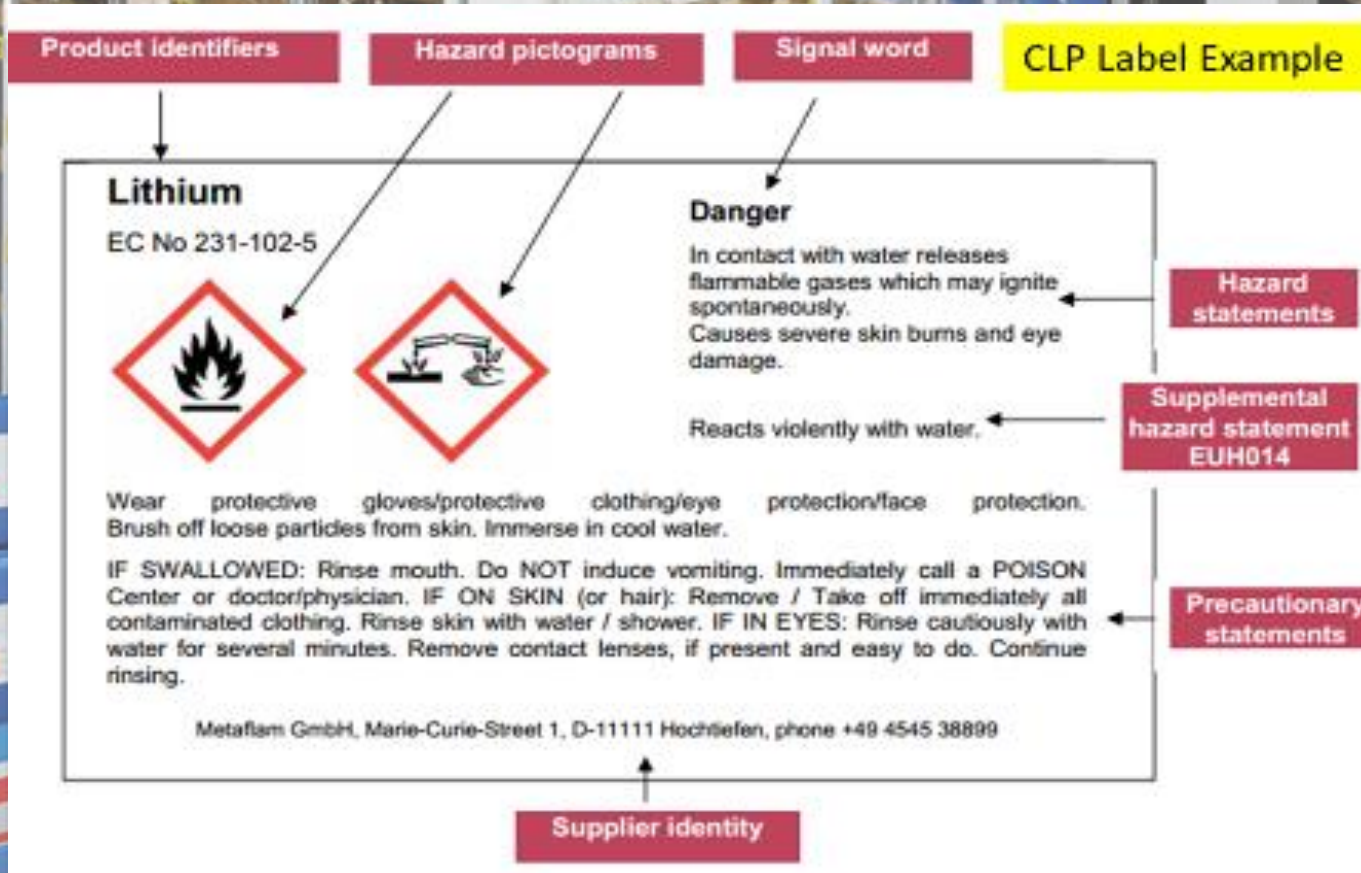
Company name and address

B3 Are you:

The producer of the waste? ☐

The importer of the waste? ☐

Supply



GHS Symbols



Explosive



Flammable
Pyrophoric



Compressed Gas
Liquefied Gas



Oxidizing



Corrosive
Corrosive to metals



Toxic



Harmful
Irritant
Skin Sensitizer



Environment Hazard

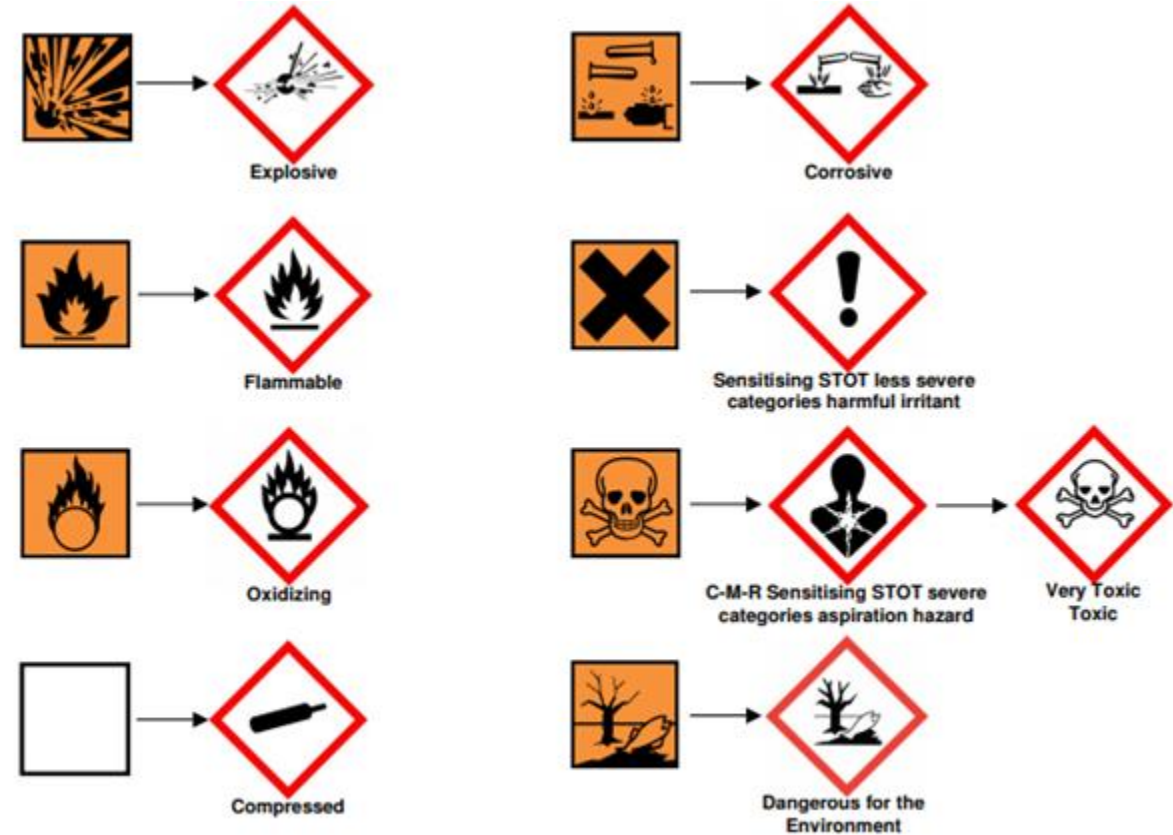


Respiratory Sensitizer
Aspiration Hazard
Reproductive Toxin

Carcinogen
Mutagenic

Legacy

- EU implementation of GHS came into force on 1st June 2015 under the Classification, Labelling and Packaging (CLP) regulation.
- Governed by the European Chemical Agency (ECHA)



Safety Data Sheets

16 sections detailing supplier information, emergency contacts, material properties, hazards, disposal advice and toxicological / ecological data

Strict, regulated format

Designed for guidance on controlled use and initial response / first aid

Negatives

- Incomplete or outdated information
- Limited scope of use (minimum health and safety requirements)
- Not peer reviewed – ‘competent’ author
- Lack of information on mixtures or reactions
- Units of properties not always Standardised International Units (SIU)

Emergency Response Guidebook



A guidebook intended for use by first responders
during the initial phase of a transportation incident
involving hazardous materials/dangerous goods

2024 EMERGENCY RESPONSE GUIDEBOOK



CAMEO Chemicals

Acetone

Sodium Bicarbonate


Hydrochloric Acid (solution)

Sugar (Sucrose)


Nitric Acid, Red Fuming




Emergency Response Guidebook (ERG)




White pages identify container type and hazard markings




Yellow pages identify by UN number



Blue pages identify by alphabetical order

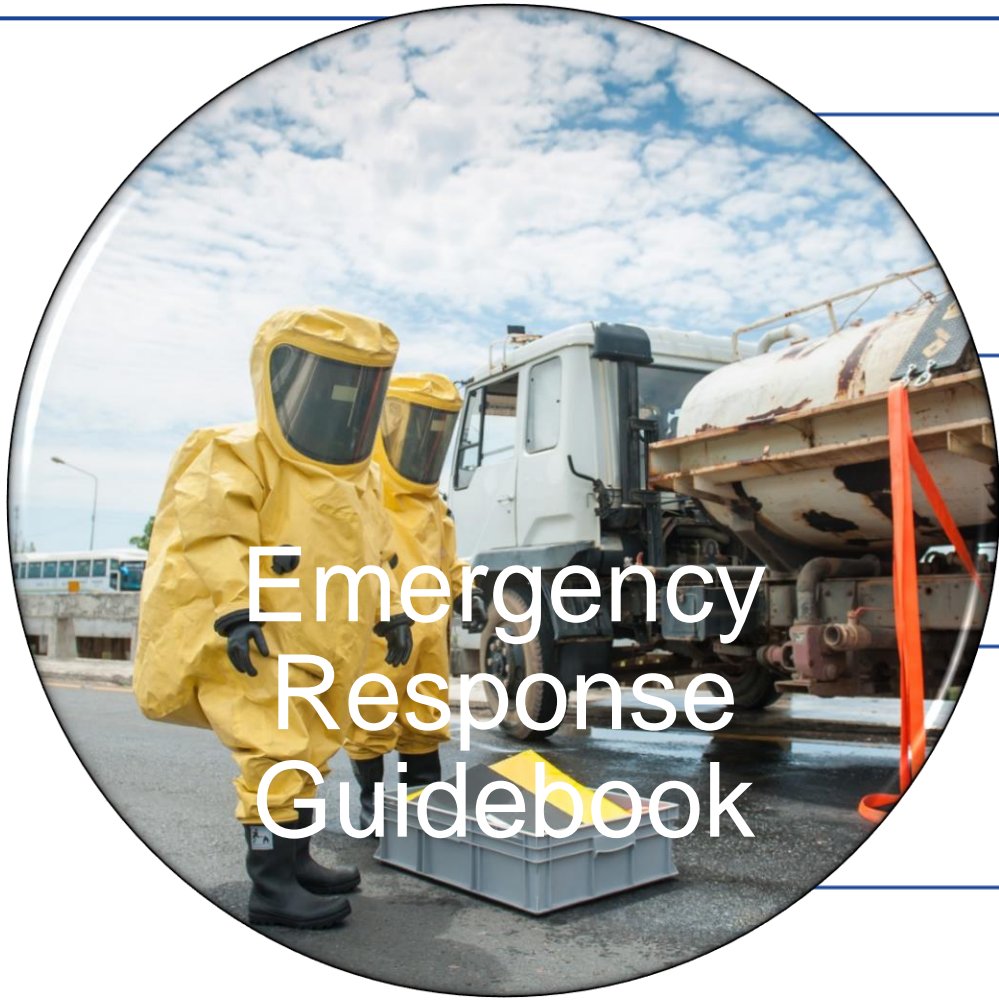


Orange 'guide pages' provide emergency response guidelines



Green pages provide tables for isolation distances for toxic by inhalation (TIH) and water reactives

Introduction



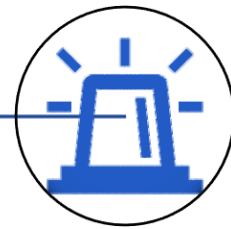
Transportation



Initial
Advice



Generic



Defensive

Structure of ERG

GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELING OF CHEMICALS (GHS) (May be found on means of containment during transport)

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS) is an international guideline published by the United Nations. The GHS aims to harmonize the classification and labeling systems for all sectors involved in the life cycle of a chemical (production, storage, transport, workplace use, consumer use and presence in the environment).

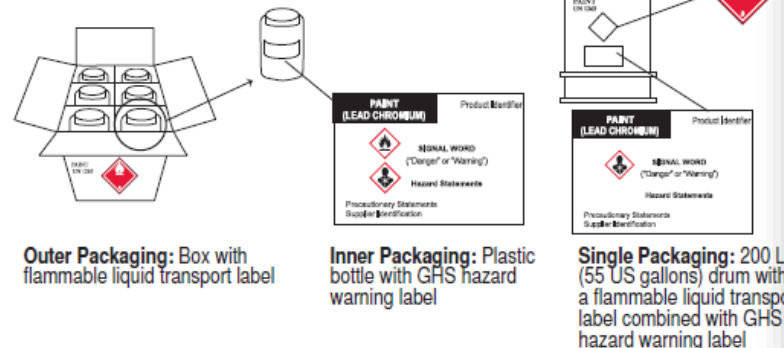
The GHS has nine symbols used to convey specific physical, health and environmental hazard information. These symbols are part of a pictogram that is diamond shaped and includes the GHS symbol in black on a white background with a red frame. The pictogram is part of the GHS label, which also includes the following information:

- Signal word
- Hazard statement
- Precautionary statements
- Product identifier
- Supplier identification

GHS pictograms are similar in shape to transport labels; however, transport labels have backgrounds of different colors.

The elements of the GHS that address signal words and hazard statements are not expected to be adopted in the transport sector. For substances and mixtures covered by the UN Recommendations on the Transport of Dangerous Goods, Model Regulations, the transport labels for physical hazards will have precedence. In transport, a GHS pictogram for the same (or lesser) hazard as the one reflected by the transport label or placard should not be present, but it could exist on the package.

Examples of GHS labeling:

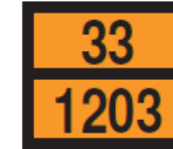


In some cases, such as on drums or international bulk containers (IBCs), which must address information for all sectors, the GHS label may be found in addition to the required transport labels and placards. Both types of labels (GHS and transport) will differ in a way that will make them easy to identify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

GHS Pictograms	Physical hazards	GHS Pictograms	Health and Environmental hazards
	Explosive; Self-reactive; Organic peroxide		Skin corrosion; Serious eye damage
	Flammable; Pyrophoric; Self-reactive; Organic peroxide; Self-heating; Emits flammable gases when in contact with water		Acute toxicity (harmful); Skin sensitizer; Irritant (skin and eye); Narcotic effect; Respiratory tract irritant; Hazardous to ozone layer (environment)
	Oxidizer		Respiratory sensitizer; Mutagen; Carcinogen; Reproductive toxicity; Target organ toxicity; Aspiration hazard
	Gas under pressure		Hazardous to aquatic environment
	Corrosive to metals		Acute toxicity (fatal or toxic)

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 4-digit ID number is in the bottom half of the orange panel.



The hazard identification number in the top half of the orange panel consists of two or three digits. In general, the digits indicate the following hazards:

- 2 - Emission of gas due to pressure or chemical reaction
- 3 - Flammability of liquids (vapors) and gases or self-heating liquid
- 4 - Flammability of solids or self-heating solid
- 5 - Oxidizing (fire-intensifying) effect
- 6 - Toxicity or risk of infection
- 7 - Radioactivity
- 8 - Corrosivity
- 9 - Risk of spontaneous violent reaction

NOTE: The risk of spontaneous violent reaction within the meaning of digit 9 includes the possibility, due to the nature of a substance, of a risk of explosion, disintegration and polymerization reaction followed by the release of considerable heat or flammable and/or toxic gases.

- 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 digit, the digit 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).

ID Guide Name of Material
No. No.

1757 154 Chromic fluoride, solution
1758 137 Chromium oxychloride
1759 154 Corrosive solid, n.o.s.
1759 154 Ferrous chloride, solid
1760 154 Chemical kit
1760 154 Compounds, cleaning liquid (corrosive)
1760 154 Compounds, tree or weed killing, liquid (corrosive)
1760 154 Corrosive liquid, n.o.s.
1760 154 Ferrous chloride, solution
1761 154 Cupriethylenediamine, solution
1762 156 Cyclohexenyltrichlorosilane
1763 156 Cyclohexyltrichlorosilane
1764 153 Dichloroacetic acid
1765 156 Dichloroacetyl chloride
1766 156 Dichlorophenyltrichlorosilane
1767 155 Diethyldichlorosilane
1768 154 Difluorophosphoric acid, anhydrous
1769 156 Diphenyldichlorosilane
1770 153 Diphenylmethyl bromide
1771 156 Dodecyltrichlorosilane
1773 157 Ferric chloride, anhydrous
1774 154 Fire extinguisher charges, corrosive liquid

UN 1836 | Guide 137 Thionyl Chloride

1777 137 Fluorosulphonic acid
1778 154 Fluorosilicic acid
1778 154 Hydrofluorosilicic acid

ID Guide Name of Material
No. No.

1779 153 Formic acid
1779 153 Formic acid, with more than 85% acid
1780 156 Fumaryl chloride
1781 156 Hexadecyltrichlorosilane
1782 154 Hexafluorophosphoric acid
1783 153 Hexamethylenediamine, solution
1784 156 Hexyltrichlorosilane
1786 157 Hydrofluoric acid and Sulfuric acid mixture
1786 157 Hydrofluoric acid and Sulphuric acid mixture
1786 157 Sulfuric acid and Hydrofluoric acid mixture
1786 157 Sulphuric acid and Hydrofluoric acid mixture
1787 154 Hydriodic acid
1788 154 Hydrobromic acid
1789 157 Hydrochloric acid
1789 157 Muriatic acid
1790 157 Hydrofluoric acid
1791 154 Hypochlorite solution
1791 154 Sodium hypochlorite
1792 157 Iodine monochloride, solid
1793 153 Isopropyl acid phosphate
1794 154 Lead sulfate, with more than

1796 157 Nitrating acid mixture with not more than 50% nitric acid
1798 157 Aqua regia
1798 157 Nitrohydrochloric acid

ID Guide Name of Material
No. No.

1799 156 Nonyltrichlorosilane
1800 156 Octadecyltrichlorosilane
1801 156 Octyltrichlorosilane
1802 157 Perchloric acid, with not more than 50% acid
1803 153 Phenolsulfonic acid, liquid
1803 153 Phenolsulphonic acid, liquid
1804 156 Phenyltrichlorosilane
1805 154 Phosphoric acid, solution
1806 137 Phosphorus pentachloride
1807 137 Phosphorus pentoxide
1808 137 Phosphorus tribromide
1809 137 Phosphorus trichloride
1810 137 Phosphorus oxychloride
1811 154 Potassium hydrogen difluoride, solid
1812 154 Potassium fluoride, solid
1813 154 Caustic potash, solid
1813 154 Potassium hydroxide, solid
1814 154 Caustic potash, solution
1814 154 Potassium hydroxide, solution
1815 132 Propionyl chloride
1816 155 Propyltrichlorosilane
1817 137 Pyrosulfuryl chloride
1817 137 Pyrosulphuryl chloride
1818 157 Silicon tetrachloride
1819 154 Sodium aluminate, solution
1823 154 Caustic soda, solid
1823 154 Sodium hydroxide, solid
1824 154 Caustic soda, solution
1824 154 Sodium hydroxide, solution
1825 157 Sodium monoxide

ID Guide Name of Material
No. No.

1826 157 Nitrating acid mixture, spent, with more than 50% nitric acid
1826 157 Nitrating acid mixture, spent, with not more than 50% nitric acid
1827 137 Stannic chloride, anhydrous
1827 137 Tin tetrachloride
1828 137 Sulfur chlorides
1828 137 Sulphur chlorides
1829 137 Sulfur trioxide, stabilized
1829 137 Sulphur trioxide, stabilized
1830 137 Sulfuric acid
1830 137 Sulfuric acid, with more than 51% acid
1830 137 Sulphuric acid
1830 137 Sulphuric acid, with more than 51% acid
1831 137 Sulfuric acid, fuming
1831 137 Sulphuric acid, fuming
1832 137 Sulfuric acid, spent
1832 137 Sulphuric acid, spent
1833 154 Sulfurous acid
1833 154 Sulphurous acid
1834 137 Sulfuryl chloride
1834 137 Sulphuryl chloride
1835 153 Tetramethylammonium hydroxide, solution
1836 137 Thionyl chloride
1837 157 Thiophosphoryl chloride
1838 137 Titanium tetrachloride
1839 153 Trichloroacetic acid
1840 154 Zinc chloride, solution
1841 171 Acetaldehyde ammonia

Blue Pages

Name of Material Guide ID No. No.

Thiocarbamate pesticide, liquid, toxic, flammable	131	3005
Thiocarbamate pesticide, solid, 151	2771	
poisonous		
Thiocarbamate pesticide, solid, 151	2771	
toxic		
Thioglycol	153	2966
Thioglycolic acid	153	1940
Thiolactic acid	153	2936
Thionyl chloride	137	1836
Thiophene	133	2414
Thiophosgene	157	2474
Thiophosphoryl chloride	157	1837
Thiourea dioxide	135	3341
Tinctures, medicinal	127	1293
Tin tetrachloride	137	1827
Titanium disulfide	135	3174
Titanium disulphide	135	3174
Titanium hydride	170	1871
Titanium powder, dry	135	2546
Titanium powder, wetted with not less than 25% water	170	1352
Titanium sponge granules	170	2878
Titanium sponge powders	170	2878
Titanium tetrachloride	137	1838
Titanium trichloride, pyrophoric	135	2441
Titanium trichloride mixture	157	2869
Titanium trichloride mixture, pyrophoric	135	2441
TNT, wetted with not less than 10% water	113	3366
TNT, wetted with not less than 30% water	113	1356
Toluene	130	1294
2,4-Toluenediamine, solid	151	1709

Name of Material Guide ID No. No.

2,4-Toluenediamine, solution	151	3418
Toluene diisocyanate	156	2078
Toluidines, liquid	153	1708
Toluidines, solid	153	3451
2,4-Toluylenediamine, solid	151	1709
2,4-Toluylenediamine, solution	151	3418
Toxic by inhalation liquid, corrosive, flammable, n.o.s. (Inhalation Hazard Zone A)	131	3492
Toxic by inhalation liquid, corrosive, flammable, n.o.s. (Inhalation Hazard Zone B)	131	3493
Toxic by inhalation liquid, corrosive, n.o.s. (Inhalation Hazard Zone A)	154	3389
Toxic by inhalation liquid, corrosive, n.o.s. (Inhalation Hazard Zone B)	154	3390
Toxic by inhalation liquid, flammable, corrosive, n.o.s. (Inhalation Hazard Zone A)	131	3488
Toxic by inhalation liquid, flammable, corrosive, n.o.s. (Inhalation Hazard Zone B)	131	3489
Toxic by inhalation liquid, flammable, n.o.s. (Inhalation Hazard Zone A)	131	3383
Toxic by inhalation liquid, flammable, n.o.s. (Inhalation Hazard Zone B)	131	3384
Toxic by inhalation liquid, n.o.s. (Inhalation Hazard Zone A)	151	3381
Toxic by inhalation liquid, n.o.s. (Inhalation Hazard Zone B)	151	3382
Toxic by inhalation liquid, oxidizing, n.o.s. (Inhalation Hazard Zone A)	142	3387
Toxic by inhalation liquid, oxidizing, n.o.s. (Inhalation Hazard Zone B)	142	3388

Name of Material Guide ID No. No.

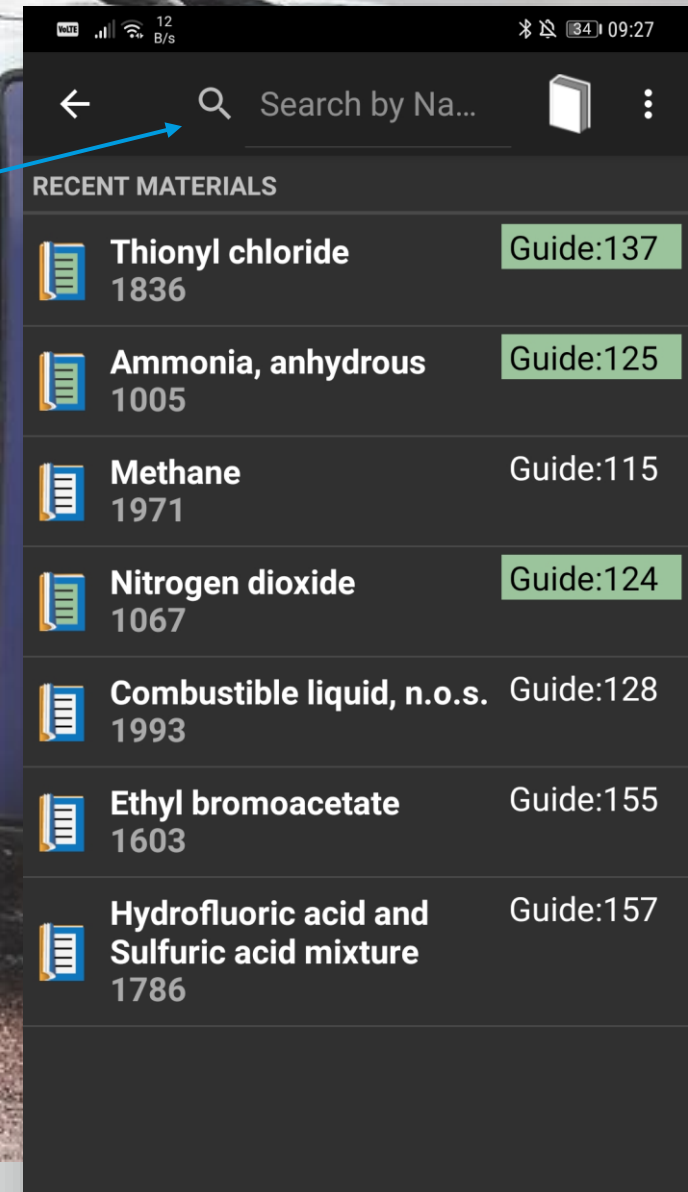
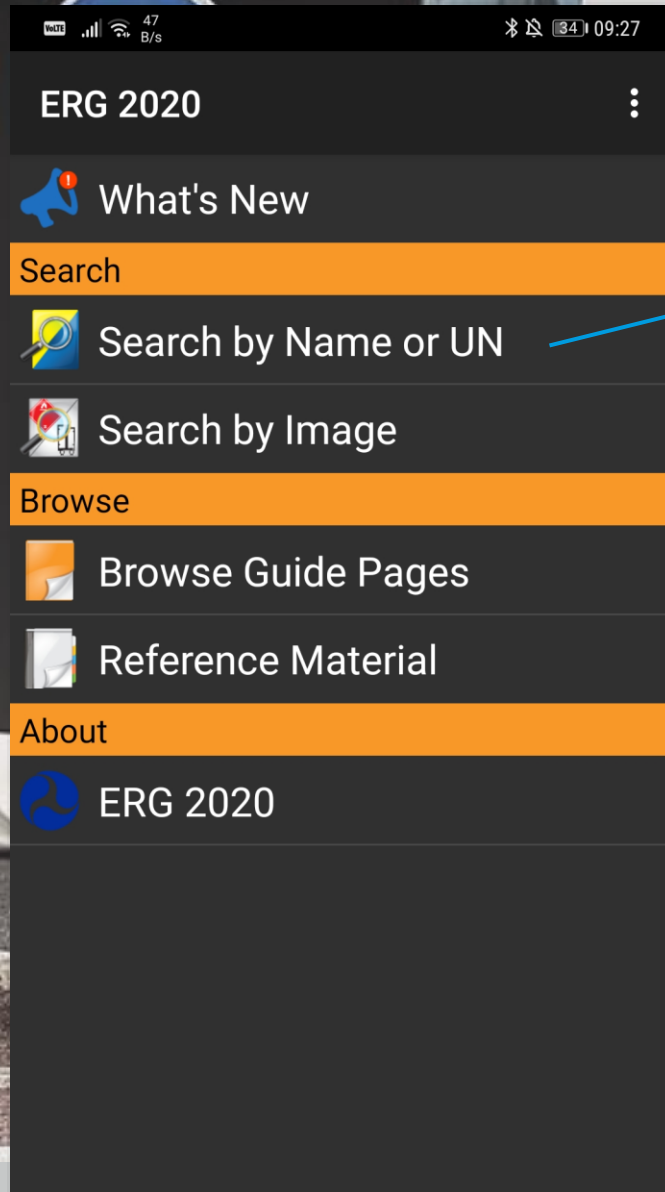
Toxic by inhalation liquid, water-reactive, flammable, n.o.s. (Inhalation Hazard Zone A)	155	3490
Toxic by inhalation liquid, water-reactive, flammable, n.o.s. (Inhalation Hazard Zone B)	155	3491
Toxic by inhalation liquid, n.o.s.	139	3385
Toxic liquid, corrosive, inorganic, n.o.s.	154	3289
Toxic liquid, corrosive, organic, n.o.s.	154	2927
Toxic liquid, flammable, organic, n.o.s.	131	2929
Toxic liquid, inorganic, n.o.s.	151	3287
Toxic liquid, organic, n.o.s.	153	2810
Toxic liquid, oxidizing, n.o.s.	142	3122
Toxic liquid, water-reactive, n.o.s.	139	3123
Toxic solid, corrosive, inorganic, n.o.s.	154	3290
Toxic solid, corrosive, organic, n.o.s.	154	2928
Toxic solid, flammable, inorganic, n.o.s.	134	3535
Toxic solid, flammable, organic, n.o.s.	134	2930
Toxic solid, inorganic, n.o.s.	151	3288
Toxic solid, organic, n.o.s.	154	2811
Toxic solid, oxidizing, n.o.s.	141	3086
Toxic solid, self-heating, n.o.s.	136	3124
Toxic solid, water-reactive, n.o.s.	139	3125

Name of Material Guide ID No. No.

Toxins	153	—
Toxins, extracted from living sources, liquid, n.o.s.	153	3172
Toxins, extracted from living sources, solid, n.o.s.	153	3462
Triallylamine	132	2610
Triallyl borate	156	2609
Triallyl phosphite, liquid	134	2764
Triallyl phosphite, solid	134	2764
Triallyl phosphite, toxic	134	2998
Triazine pesticide, liquid, poisonous, flammable	131	2997
Triazine pesticide, liquid, toxic	151	2998
Triazine pesticide, liquid, toxic, flammable	131	2997
Triazine pesticide, solid, poisonous	151	2763
Triazine pesticide, solid, toxic	151	2763
Tributylamine	153	2542
Tributylphosphane	135	3254
Trichloroacetic acid	153	1839
Trichloroacetic acid, solution	153	2564
Trichloroacetyl chloride	156	2442
Trichlorobenzenes, liquid	153	2321
Trichlorobutene	152	2322
1,1,1-Trichloroethane	160	2831
Trichloroethylene	160	1710
Trichloroisocyanuric acid, dry	140	2468
Trichlorosilane	139	1295
Tricresyl phosphate	151	2574
Triethylamine	132	1296
Triethylenetetramine	153	2259

Thionyl Chloride | Guide 137
UN 1836

Android & IOS



Orange Guide Pages

GUIDE SUBSTANCES - WATER-REACTIVE - CORROSIVE 137

POTENTIAL HAZARDS

HEALTH

- CORROSIVE and/or TOXIC; inhalation, ingestion or contact (skin, eyes) with vapors, 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 environmental contamination.

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 911. Then call emergency response telephone number on shipping paper.** If shipping paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
- 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).
- Wear chemical protective clothing that is specifically recommended by the manufacturer **when there is NO RISK OF FIRE**.
- Structural firefighters' protective clothing provides thermal protection **but only limited chemical protection**.

EVACUATION

Immediate precautionary measure

- Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

Spill

- For **highlighted materials**: see Table 1 - Initial Isolation and Protective Action Distances.
- For non-highlighted materials: increase the immediate precautionary measure distance, in the downwind direction, as necessary.

Fire

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



In Canada, an Emergency Response Assistance Plan (ERAP) may be required for this product. Please consult the shipping paper and/or the ERAP Program Section (page 390).

SUBSTANCES - WATER-REACTIVE - CORROSIVE GUIDE 137

EMERGENCY RESPONSE

FIRE

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

Small Fire

- Dry chemical or CO₂.
- If it can be done safely, move undamaged containers away from the area around the fire.

Large Fire

- Flood fire area with large quantities of water, while knocking down vapors with water fog. If insufficient water supply, responders should withdraw.

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 discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.

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.
- Use water spray to reduce vapors; 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

- Call 911 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.
- **Do not perform mouth-to-mouth resuscitation if victim ingested or inhaled the substance; wash face and mouth before giving artificial respiration. Use 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.

Shipping paper. If shipping paper on the inside back cover.

equipped.

the manufacturer **when there is**

only limited chemical protection

for liquids and at least 25 meters

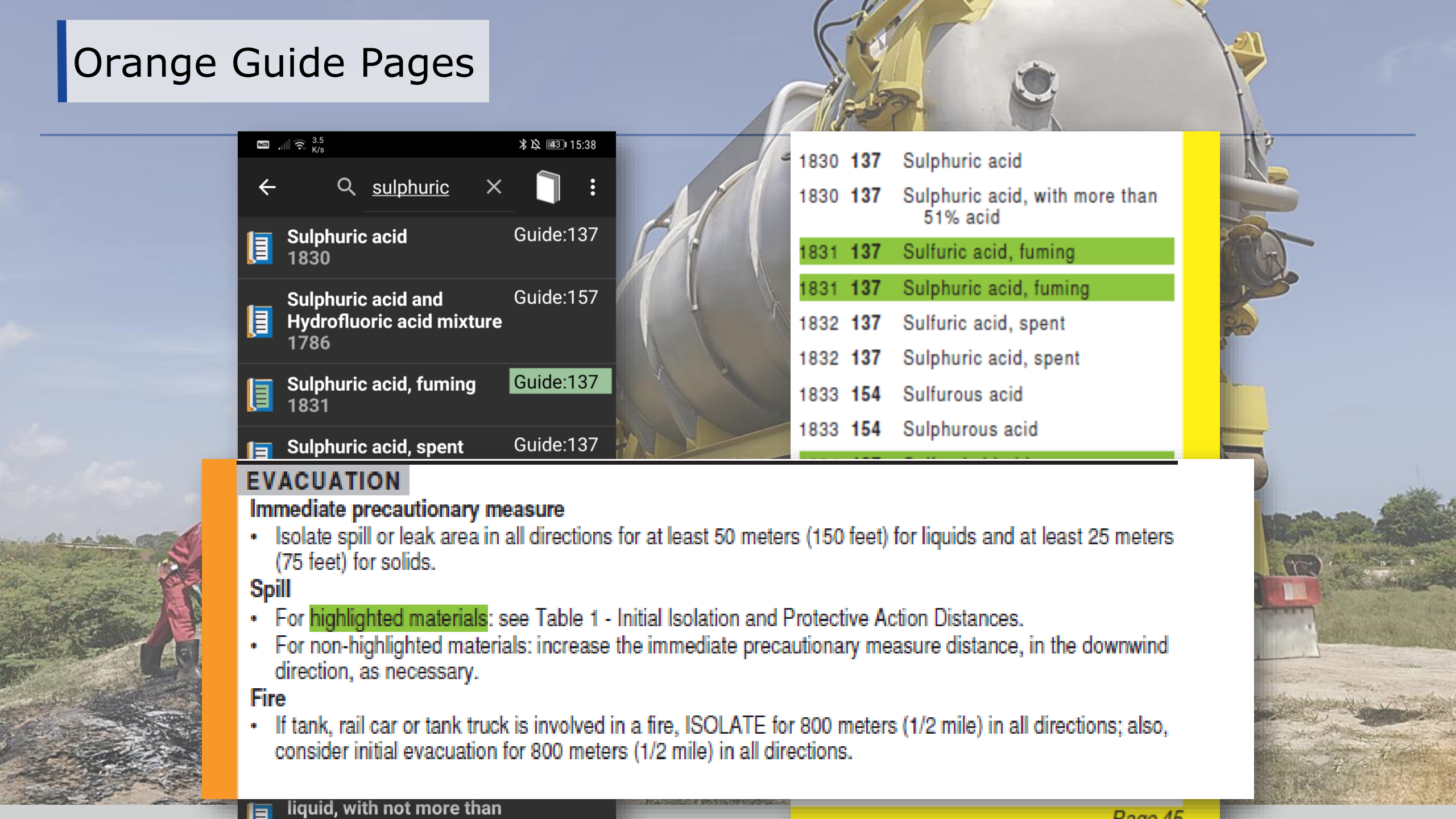
tion Distances.

asure distance, in the downwind

(1/2 mile) in all directions; also,





may be required for this product.
ction (page 390).

Orange Guide Pages



3.5 K/s 15:38

← ×

	Sulphuric acid 1830	Guide:137
	Sulphuric acid and Hydrofluoric acid mixture 1786	Guide:157
	Sulphuric acid, fuming 1831	Guide:137
	Sulphuric acid, spent	Guide:137

1830	137	Sulphuric acid
1830	137	Sulphuric acid, with more than 51% acid
1831	137	Sulfuric acid, fuming
1831	137	Sulphuric acid, fuming
1832	137	Sulfuric acid, spent
1832	137	Sulphuric acid, spent
1833	154	Sulfurous acid
1833	154	Sulphurous acid

EVACUATION

Immediate precautionary measure

- Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

Spill

- For highlighted materials: see Table 1 - Initial Isolation and Protective Action Distances.
- For non-highlighted materials: increase the immediate precautionary measure distance, in the downwind direction, as necessary.

Fire

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

Orange Guide Pages

GUIDE SUBSTANCES - WATER-REACTIVE - CORROSIVE 137

POTENTIAL HAZARDS

HEALTH

- CORROSIVE and/or TOXIC; inhalation, ingestion or contact (skin, eyes) with vapors, 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 environmental contamination.

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 911. Then call emergency response telephone number on shipping paper.** If shipping paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
- 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).
- Wear chemical protective clothing that is specifically recommended by the manufacturer **when there is NO RISK OF FIRE**.
- Structural firefighters' protective clothing provides thermal protection **but only limited chemical protection**.

EVACUATION

Immediate precautionary measure

- Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

Spill

- For **highlighted materials**: see Table 1 - Initial Isolation and Protective Action Distances.
- For non-highlighted materials: increase the immediate precautionary measure distance, in the downwind direction, as necessary.

Fire

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



In Canada, an Emergency Response Assistance Plan (ERAP) may be required for this product. Please consult the shipping paper and/or the ERAP Program Section (page 390).

SUBSTANCES - WATER-REACTIVE - CORROSIVE GUIDE 137

EMERGENCY RESPONSE

FIRE

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

Small Fire

- Dry chemical or CO₂.
- If it can be done safely, move undamaged containers away from the area around the fire.

Large Fire

- Flood fire area with large quantities of water, while knocking down vapors with water fog. If insufficient water supply, responders should withdraw.

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 discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.

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.
- Use water spray to reduce vapors; 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

- Call 911 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.
- **Do not perform mouth-to-mouth resuscitation if victim ingested or inhaled the substance; wash face and mouth before giving artificial respiration. Use 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.

Orange Guide Pages

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← UN 1836

Thionyl chloride

Guide Page Initial Isolation and Protective Action Distanc...

GUIDE 137

Substances - Water-Reactive - Corrosive

POTENTIAL HAZARDS

HEALTH

- CORROSIVE and/or TOXIC; inhalation, ingestion or contact (skin, eyes) with vapors, 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 environmental contamination.

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

107 B/s 09:27

← UN 1836

Thionyl chloride

Initial Isolation and Protective Action Distanc...

SMALL SPILLS - (From a small package or small leak from a large package)

ID	MATERIAL	First ISOLATE in all Directions	Then PROTECT Downwind
1836	Thionyl chloride (when spilled on land)	30 m	DAY 0.1 km NIGHT 0.2 km
1836	Thionyl chloride (when spilled in water)	100 m	DAY 0.9 km NIGHT 2.9 km

TIH Gas(es) Produced when spilled in water Hydrogen chloride (HCl)
Sulfur dioxide (SO2)

LARGE SPILLS - (From a large package or many small packages)

ID	MATERIAL	First ISOLATE in all Directions	Then PROTECT Downwind
1836	Thionyl chloride (when spilled on land)	30 m	DAY 0.3 km NIGHT 0.5 km
1836	Thionyl chloride (when spilled in	800 m	DAY NIGHT

Green Pages

TABLE 2 - WATER-REACTIVE MATERIALS WHICH PRODUCE TOXIC GASES

Materials Which Produce Large Amounts of Toxic-by-Inhalation (TIH) (PIH in the US) Gas(es) When Spilled in Water			
ID No.	Guide No.	Name of Material	TIH Gas(es) Produced
1777	137	Fluorosulfonic acid	HF
1777	137	Fluorosulphonic acid	HF
1781	156	Hexadecyltrichlorosilane	HCl
1784	156	Hexyltrichlorosilane	HCl
1799	156	Nonyltrichlorosilane	HCl
1800	156	Octadecyltrichlorosilane	HCl
1801	156	Octyltrichlorosilane	HCl
1804	156	Phenyltrichlorosilane	HCl
1806	137	Phosphorus pentachloride	
1808	137	Phosphorus tribromide	
1809	137	Phosphorus trichloride	
1810	137	Phosphorus oxychloride	
1815	132	Propionyl chloride	
1816	155	Propyltrichlorosilane	
1818	157	Silicon tetrachloride	
1828	137	Sulfur chlorides	
1828	137	Sulphur chlorides	
1834	137	Sulfuryl chloride	
1834	137	Sulphuryl chloride	
1836	137	Thionyl chloride	
1836	137	Thionyl chloride	
1838	137	Titanium tetrachloride	
1838	137	Titanium tetrachloride	
1898	156	Acetyl iodide	
1923	135	Calcium dithionite	

Chemical Symbols for TIH (PIH in the US) Gases:

Br ₂	Bromine	HF	Hydrogen fluoride
Cl ₂	Chlorine	HI	Hydrogen iodide
HBr	Hydrogen bromide	H ₂ S	Hydrogen sulfide
HCl	Hydrogen chloride	H ₂ S	Hydrogen sulphide
HCN	Hydrogen cyanide	NH ₃	Ammonia

Use this list only when material is spilled in water

TABLE 1

TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

			SMALL SPILLS (From a small package or small leak from a large package)				(From a
ID No.	Guide	NAME OF MATERIAL	First ISOLATE in all Directions	Then PROTECT persons Downwind during		First ISOLATE in all Direc	
			Meters (Feet)	DAY Kilometers (Miles)	NIGHT Kilometers (Miles)	Meters (F	
1810	137	Phosphorus oxychloride (when spilled on land)	30 m (100 ft)	0.3 km (0.2 mi)	0.6 km (0.4 mi)	100 m (30	
1834	137	Sulfuryl chloride (when spilled on land)	30 m (100 ft)	0.2 km (0.1 mi)	0.4 km (0.3 mi)	60 m (20	
1834	137	Sulfuryl chloride (when spilled in water)	30 m (100 ft)	0.1 km (0.1 mi)	0.1 km (0.1 mi)	30 m (10	
1834	137	Sulphuryl chloride (when spilled on land)	30 m (100 ft)	0.2 km (0.1 mi)	0.4 km (0.3 mi)	60 m (20	
1834	137	Sulphuryl chloride (when spilled in water)	30 m (100 ft)	0.1 km (0.1 mi)	0.1 km (0.1 mi)	30 m (10	
1836	137	Thionyl chloride (when spilled on land)	30 m (100 ft)	0.1 km (0.1 mi)	0.2 km (0.2 mi)	30 m (10	
1836	137	Thionyl chloride (when spilled in water)	100 m (300 ft)	0.9 km (0.6 mi)	2.9 km (1.8 mi)	800 m (25	
1838	137	Titanium tetrachloride (when spilled on land)	30 m (100 ft)	0.1 km (0.1 mi)	0.2 km (0.1 mi)	30 m (10	
1838	137	Titanium tetrachloride (when spilled in water)	30 m (100 ft)	0.1 km (0.1 mi)	0.1 km (0.1 mi)	60 m (20	
1859	125	Silicon tetrafluoride	30 m (100 ft)	0.2 km (0.1 mi)	0.8 km (0.5 mi)	100 m (30	
1859	125	Silicon tetrafluoride, compressed	30 m (100 ft)	0.2 km (0.1 mi)	0.8 km (0.5 mi)	100 m (30	
1892	151	Ethylchloroarsine	150 m (500 ft)	1.5 km (0.9 mi)	2.1 km (1.3 mi)	400 m (12	
1898	156	Acetyl iodide (when spilled in water)	30 m (100 ft)	0.1 km (0.1 mi)	0.1 km (0.1 mi)	30 m (10	
1911	119	Diborane	60 m (200 ft)	0.3 km (0.2 mi)	1.2 km (0.7 mi)	300 m (10	
1911	119	Diborane, compressed	60 m (200 ft)	0.3 km (0.2 mi)	1.2 km (0.7 mi)	300 m (10	
1911	119	Diborane mixtures	60 m (200 ft)	0.3 km (0.2 mi)	1.2 km (0.7 mi)	300 m (10	

"+" means distance can be larger in certain atmospheric conditions

TABLE 3 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES FOR LARGE SPILLS FOR DIFFERENT QUANTITIES OF SIX COMMON TIH (PIH in the US) GASES

	First ISOLATE in all Directions Meters (Feet)	Then PROTECT persons Downwind during					
		DAY			NIGHT		
		Low wind (< 6 mph = < 10 km/h)	Moderate wind (6-12 mph = 10 - 20 km/h)	High wind (> 12 mph = > 20 km/h)	Low wind (< 6 mph = < 10 km/h)	Moderate wind (6-12 mph = 10 - 20 km/h)	High wind (> 12 mph = > 20 km/h)
TRANSPORT CONTAINER		km (Miles)	km (Miles)	km (Miles)	km (Miles)	km (Miles)	km (Miles)
UN1005 Ammonia, anhydrous: Large Spills							
Rail tank car	300 (1000)	1.9 (1.2)	1.5 (0.9)	1.1 (0.6)	4.5 (2.8)	2.5 (1.5)	1.4 (0.9)
Highway tank truck or trailer	150 (500)	0.9 (0.6)	0.5 (0.3)	0.4 (0.3)	2.0 (1.3)	0.8 (0.5)	0.6 (0.4)
Agricultural nurse tank	60 (200)	0.5 (0.3)	0.3 (0.2)	0.3 (0.2)	1.4 (0.9)	0.3 (0.2)	0.3 (0.2)
Multiple small cylinders	30 (100)	0.3 (0.2)	0.2 (0.1)	0.1 (0.1)	0.7 (0.5)	0.3 (0.2)	0.2 (0.1)
TRANSPORT CONTAINER							
UN1017 Chlorine: Large Spills							
Rail tank car	1000 (3000)	10.1 (6.3)	6.8 (4.2)	5.3 (3.3)	11+ (7+)	9.2 (5.7)	6.9 (4.3)
Highway tank truck or trailer	600 (2000)	5.8 (3.6)	3.4 (2.1)	2.9 (1.8)	6.7 (4.3)	5.0 (3.1)	4.1 (2.5)
Multiple ton cylinders	300 (1000)	2.1 (1.3)	1.3 (0.8)	1.0 (0.6)	4.0 (2.5)	2.4 (1.5)	1.3 (0.8)
Multiple small cylinders or single ton cylinder	150 (500)	1.5 (0.9)	0.8 (0.5)	0.5 (0.3)	2.9 (1.8)	1.3 (0.8)	0.6 (0.4)

TABLE 3

"+" means distance can be larger in certain atmospheric conditions

Green Pages – Table

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TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

ID No.	Guide	NAME OF MATERIAL	SMALL SPILLS (From a small package or small leak from a large package)				LARGE SPILLS (From a large package or from many small packages)			
			First ISOLATE in all Directions		Then PROTECT persons Downwind during		First ISOLATE in all Directions		Then PROTECT persons Downwind during	
			Meters (Feet)		DAY Kilometers (Miles)	NIGHT Kilometers (Miles)	Meters (Feet)		DAY Kilometers (Miles)	NIGHT Kilometers (Miles)
1810	137	Phosphorus oxychloride (when spilled on land)	30 m (100 ft)		0.3 km (0.2 mi)	0.6 km (0.4 mi)	100 m (300 ft)		1.0 km (0.7 mi)	1.9 km (1.2 mi)
1834	137	Sulfuryl chloride (when spilled on land)	30 m (100 ft)		0.2 km (0.1 mi)	0.4 km (0.3 mi)	60 m (200 ft)		0.8 km (0.5 mi)	1.5 km (0.9 mi)
1834	137	Sulfuryl chloride (when spilled in water)	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)	1.6 km (1.0 mi)
1834	137	Sulphuryl chloride (when spilled on land)	30 m (100 ft)		0.2 km (0.1 mi)	0.4 km (0.3 mi)	60 m (200 ft)		0.8 km (0.5 mi)	1.5 km (0.9 mi)
1834	137	Sulphuryl chloride (when spilled in water)	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)	1.6 km (1.0 mi)
1836	137	Thionyl chloride (when spilled on land)	30 m (100 ft)		0.1 km (0.1 mi)	0.2 km (0.2 mi)	30 m (100 ft)		0.3 km (0.2 mi)	0.5 km (0.3 mi)
1836	137	Thionyl chloride (when spilled in water)	100 m (300 ft)		0.9 km (0.6 mi)	2.9 km (1.8 mi)	800 m (2500 ft)		9.7 km (6.0 mi)	11.0+ km (7.0+ mi)
1838	137	Titanium tetrachloride (when spilled on land)	30 m (100 ft)		0.1 km (0.1 mi)	0.2 km (0.1 mi)	30 m (100 ft)		0.3 km (0.2 mi)	0.5 km (0.3 mi)
1838	137	Titanium tetrachloride (when spilled in water)	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)
1859	125	Silicon tetrafluoride	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)
1859	125	Silicon tetrafluoride, compressed								
1892	151	Ethylchloroarsine	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)
1898	156	Acetyl iodide (when spilled in water)	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)

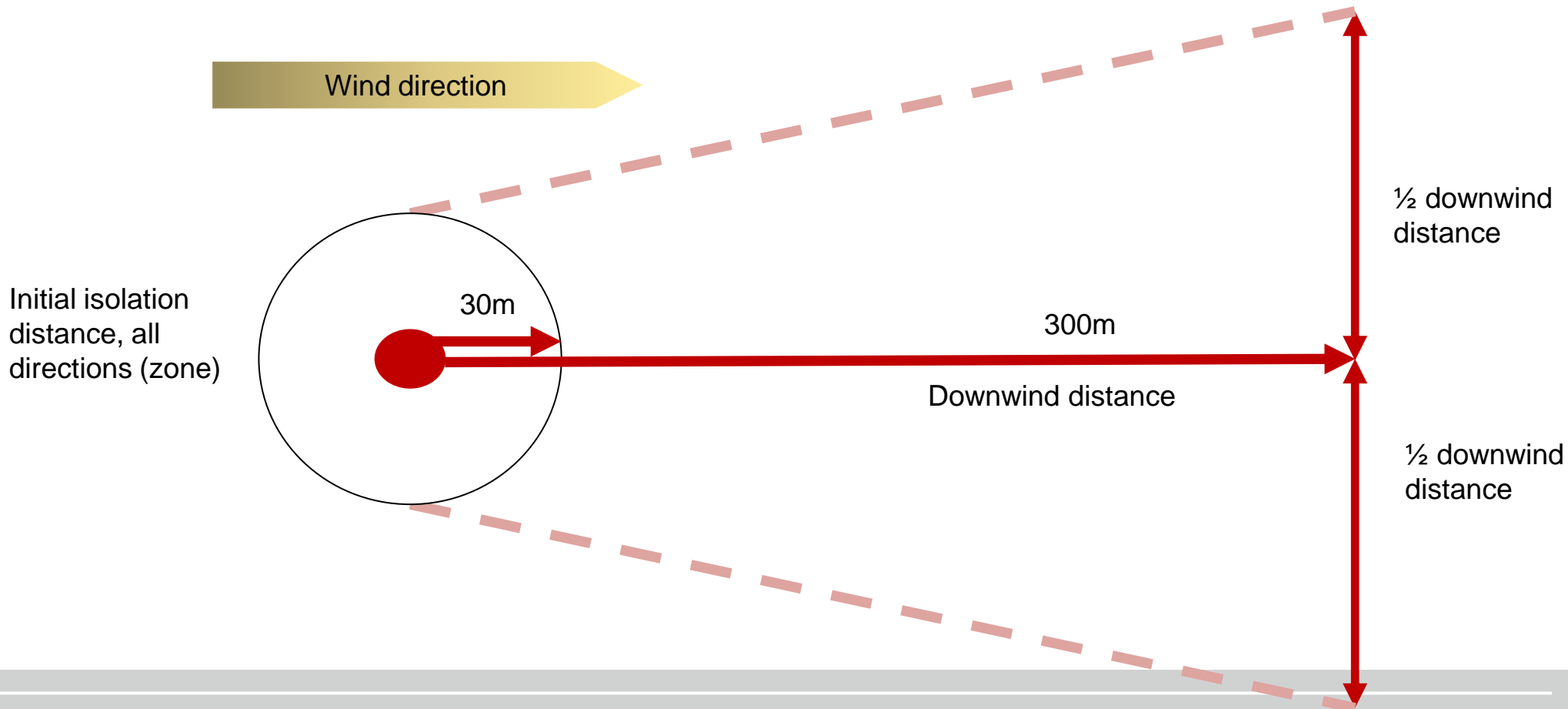
1836	137	Thionyl chloride (when spilled on land)	30 m (100 ft)		0.1 km (0.1 mi)	0.2 km (0.2 mi)	30 m (100 ft)		0.3 km (0.2 mi)	0.5 km (0.3 mi)
1836	137	Thionyl chloride (when spilled in water)	100 m (300 ft)		0.9 km (0.6 mi)	2.9 km (1.8 mi)	800 m (2500 ft)		9.7 km (6.0 mi)	11.0+ km (7.0+ mi)

"+" means distance can be larger in certain atmospheric conditions

TABLE 1

Green Pages – Table 1

Initial isolation and downwind protective action distances Thionyl Chloride – Large spill (on land) – Daytime



Green Tables - Table 1



UN 1836

Thionyl chloride

Guide Page Initial Isolation and Protective Action Distanc...

GUIDE 137

Substances - Water-Reactive - Corrosive

POTENTIAL HAZARDS

HEALTH

- CORROSIVE and/or TOXIC; inhalation, ingestion or contact (skin, eyes) with vapors, 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 environmental contamination.

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

UN 1836

Thionyl chloride

Guide Page Initial Isolation and Protective Action Distanc...

SMALL SPILLS - (From a small package or small leak from a large package)

ID	MATERIAL	First ISOLATE in all Directions	Then PROTECT Downwind
1836	Thionyl chloride (when spilled on land)	30 m	DAY 0.1 km NIGHT 0.2 km
1836	Thionyl chloride (when spilled in water)	100 m	DAY 0.9 km NIGHT 2.9 km
TIH Gas(es) Produced when spilled in water		Hydrogen chloride (HCl) Sulfur dioxide (SO ₂)	

LARGE SPILLS - (From a large package or many small packages)

ID	MATERIAL	First ISOLATE in all Directions	Then PROTECT Downwind
1836	Thionyl chloride (when spilled on land)	30 m	DAY 0.3 km NIGHT 0.5 km
1836	Thionyl chloride (when spilled in	800 m	DAY NIGHT

TABLE2 - WATER-REACTIVE MATERIALS WHICH PRODUCE TOXIC GASES

Materials Which Produce Large Amounts of Toxic-by-Inhalation (TIH)
(PIH in the US) Gas(es) When Spilled in Water

ID No.	Guide No.	Name of Material	TIH Gas(es) Produced
1777	137	Fluorosulfonic acid	HF
1777	137	Fluorosulphonic acid	HF
1781	156	Hexadecyltrichlorosilane	HCl
1784	156	Hexyltrichlorosilane	HCl
1799	156	Nonyltrichlorosilane	HCl
1800	156	Octadecyltrichlorosilane	HCl
1801	156	Octyltrichlorosilane	HCl
1804	156	Phenyltrichlorosilane	HCl
1806	137	Phosphorus pentachloride	HCl
1808	137	Phosphorus tribromide	HBr
1809	137	Phosphorus trichloride	HCl
1810	137	Phosphorus oxychloride	HCl
1815	132	Propionyl chloride	HCl
1816	155	Propyltrichlorosilane	HCl
1818	157	Silicon tetrachloride	HCl
1828	137	Sulfur chlorides	HCl SO ₂ H ₂ S
1828	137	Sulphur chlorides	HCl SO ₂ H ₂ S
1834	137	Sulfuryl chloride	HCl
1834	137	Sulphuryl chloride	HCl
1836	137	Thionyl chloride	HCl SO ₂
1838	137	Titanium tetrachloride	HCl
1898	156	Acetyl iodide	HI
1923	135	Calcium dithionite	H ₂ S SO ₂

Chemical Symbols for TIH (PIH in the US) Gases:

Br ₂	Bromine	HF	Hydrogen fluoride	NO ₂	Nitrogen dioxide
Cl ₂	Chlorine	HI	Hydrogen iodide	PH ₃	Phosphine
HBr	Hydrogen bromide	H ₂ S	Hydrogen sulfide	SO ₂	Sulfur dioxide
HCl	Hydrogen chloride	H ₂ S	Hydrogen sulphide	SO ₂	Sulphur dioxide
HCN	Hydrogen cyanide	NH ₃	Ammonia		

Use this list only when material is spilled in water.

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Green Pages – Table 2

UN 1836			
Thionyl chloride			
Initial Isolation and Protective Action Distanc...			
SMALL SPILLS - (From a small package or small leak from a large package)			
ID	MATERIAL	First ISOLATE in all Directions	Then PROTECT Downwind
1836	Thionyl chloride (when spilled on land)	30 m	DAY 0.1 km NIGHT 0.2 km
1836	Thionyl chloride (when spilled in water)	100 m	DAY 0.9 km NIGHT 2.9 km
TIH Gas(es) Produced when spilled in water		Hydrogen chloride (HCl) Sulfur dioxide (SO ₂)	

Green Tables – Table 3

- Ammonia, Anhydrous
- Chlorine
- Ethylene Oxide (Ethylene Oxide with Nitrogen)
- Hydrogen Chloride (Refrigerated liquid)
- Hydrogen Fluoride
- Sulphur Dioxide

HOW TO USE TABLE 3 – INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES FOR LARGE SPILLS FOR DIFFERENT QUANTITIES OF SIX COMMON TIH (PIH in the US) GASES

Table 3 lists Toxic Inhalation Hazard (TIH) 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 - and Hydrogen chloride, refrigerated liquid
- UN1052 - Hydrogen fluoride, anhydrous
- UN1079 - Sulfur dioxide/Sulphur dioxide

The materials are presented in numerical order of ID number and provide Initial Isolation and Protective Action Distances **FOR LARGE SPILLS** (more than 208 liters or 55 US gallons) involving different container types (therefore different volume capacities, see below) for day time and night time situations and different wind speeds.

- Rail tank car: 80 000 kg (176 368 lbs.)
- Highway tank truck or trailer: 20 000 – 25 000 kg (44 092 – 55 115 lbs.)
- Agricultural nurse tank: 3785 L (1000 gallons)
- Small cylinder: 72 L (19 gallons)
- Ton cylinder: 757 - 1135 L (200 - 300 gallons)

Estimating Wind Speed from Environmental Clues

mph	km/h	Wind Description	Specifications
< 6	< 10	Low wind	Wind felt on face; leaves rustle; ordinary vane moved by wind
6 - 12	10 - 20	Moderate wind	Raises dust, loose paper; small branches are moved
> 12	> 20	High wind	Large branches in motion; whistling heard in telephone wires; umbrellas used with difficulty

(Data taken from the Beaufort Wind Scale has been reworked in order to create 3 categories of wind speed: Low, Moderate and High)

Green Tables – Table 3

TABLE 3 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES FOR LARGE SPILLS FOR DIFFERENT QUANTITIES OF SIX COMMON TIH (PIH in the US) GASES

	First ISOLATE in all Directions		Then PROTECT persons Downwind during												
			DAY						NIGHT						
			Low wind (6 mph = 10 km/h)		Moderate wind (6-12 mph = 10 - 20 km/h)		High wind (12 mph = 20 km/h)		Low wind (6 mph = 10 km/h)		Moderate wind (6-12 mph = 10 - 20 km/h)		High wind (12 mph = 20 km/h)		
Meters	(Feet)	km	(Miles)	km	(Miles)	km	(Miles)	km	(Miles)	km	(Miles)	km	(Miles)	km	(Miles)
TRANSPORT CONTAINER	UN1005 Ammonia, anhydrous: Large Spills														
Rail tank car	300	(1000)	1.9	(1.2)	1.5	(0.9)	1.1	(0.6)	4.5	(2.8)	2.5	(1.5)	1.4	(0.9)	
Highway tank truck or trailer	150	(500)	0.9	(0.6)	0.5	(0.3)	0.4	(0.3)	2.0	(1.3)	0.8	(0.5)	0.6	(0.4)	
Agricultural nurse tank	60	(200)	0.5	(0.3)	0.3	(0.2)	0.3	(0.2)	1.4	(0.9)	0.3	(0.2)	0.3	(0.2)	
Multiple small cylinders	30	(100)	0.3	(0.2)	0.2	(0.1)	0.1	(0.1)	0.7	(0.5)	0.3	(0.2)	0.2	(0.1)	
TRANSPORT CONTAINER	UN1017 Chlorine: Large Spills														
Rail tank car	1000	(3000)	10.1	(6.3)	6.8	(4.2)	5.3	(3.3)	11+	(7+)	9.2	(5.7)	6.9	(4.3)	
Highway tank truck or trailer	600	(2000)	5.8	(3.6)	3.4	(2.1)	2.9	(1.8)	6.7	(4.3)	5.0	(3.1)	4.1	(2.5)	
Multiple ton cylinders	300	(1000)	2.1	(1.3)	1.3	(0.8)	1.0	(0.6)	4.0	(2.5)	2.4	(1.5)	1.3	(0.8)	
Multiple small cylinders or single ton cylinder	150	(500)	1.5	(0.9)	0.8	(0.5)	0.5	(0.3)	2.9	(1.8)	1.3	(0.8)	0.6	(0.4)	

TABLE 3

"+" means distance can be larger in certain atmospheric conditions

0 K/s

15:09

UN 1005

Ammonia, anhydrous

age Initial Isolation and Protective Action Distanc...

UN1005 Ammonia, anhydrous: Large Spills

[Rail tank car](#)

[Highway tank truck or trailer](#)

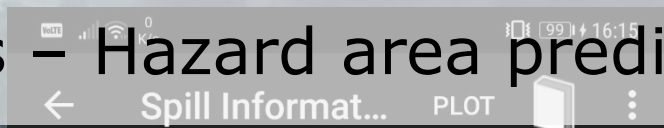
[Agricultural nurse tank](#)

[Multiple small cylinders](#)

Transport Container	Rail tank car			
First ISOLATE in all Directions	300 m			
Then protect downwind				
DAY				
Low Wind (< 10 km/h)	Moderate Wind (10 – 20 km/h)	High Wind (> 20 km/h)		
1.9 km	1.5 km	1.1 km		
Night				
Low Wind (< 10 km/h)	Moderate Wind (10 – 20 km/h)	High Wind (> 20 km/h)		
4.5 km	2.5 km	1.4 km		

Transport Container		Highway tank truck or trailer	
First ISOLATE in all Directions		150 m	
Then protect downwind			
DAY			
Low Wind	Moderate Wind	High Wind	

Green Tables – Hazard area prediction



Thionyl chloride

This tool allows you to visualize protective distances on a map. After setting a location, wind direction, and additional details, view the map by selecting the Plot button.

Spill Location

51.886208 -2.133003

After plotting, you may touch and hold anywhere on the map to move the plot to a new spill location.

Wind Direction

W

SELECT WHERE SPILL OCCURRED

On Land



In Water



Spill Details

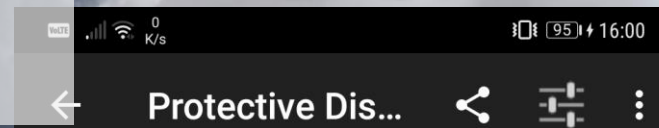
Large

SELECT TIME OF DAY

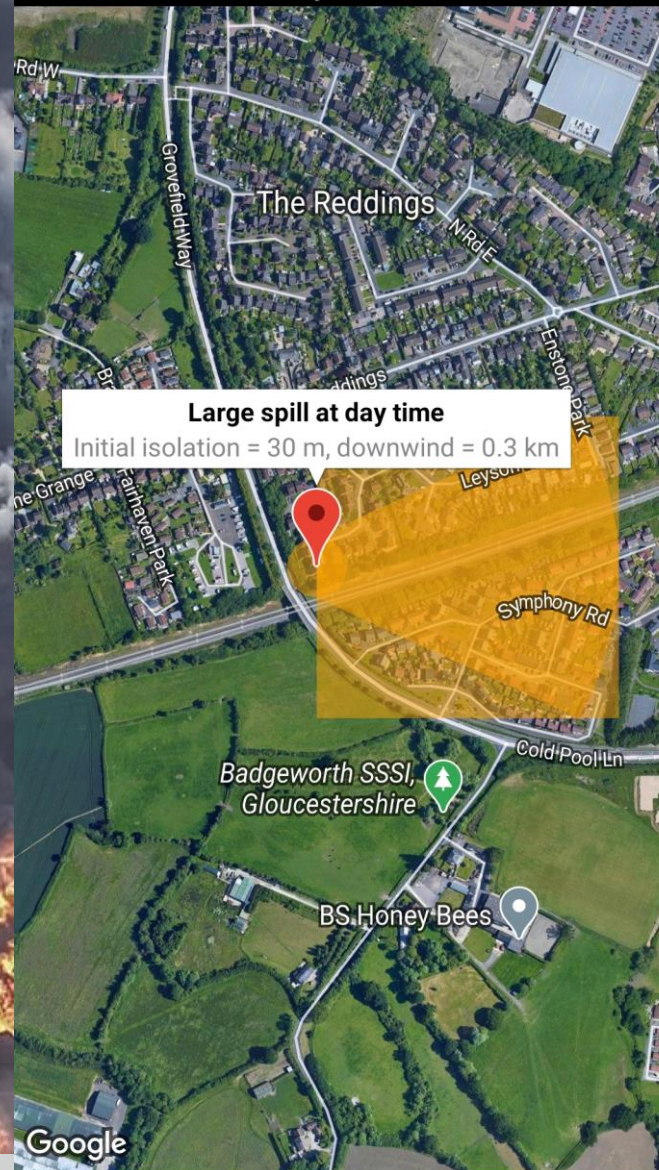
Day



Night



Thionyl chloride



White Pages – Last resort

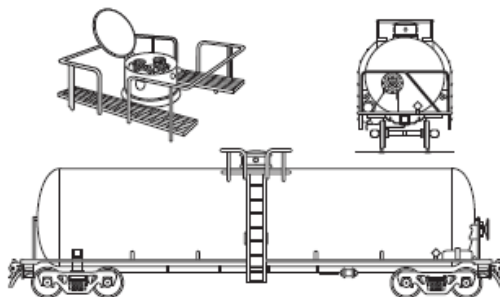
RAIL CAR IDENTIFICATION CHART

CAUTION: Emergency response personnel must be aware that rail tank cars vary widely in construction, fittings and purpose. Tank cars could transport products that may be solids, liquids or gases. The products may be under pressure. It is essential that products be identified by consulting shipping papers or train consist or contacting dispatch centers before emergency response is initiated. The information stenciled on the sides or ends of tank cars, as illustrated below, may be used to identify the product utilizing:

- the commodity name shown;
- the other information shown, especially reporting marks and car number which, when supplied to a dispatch center, will facilitate the identification of the product.

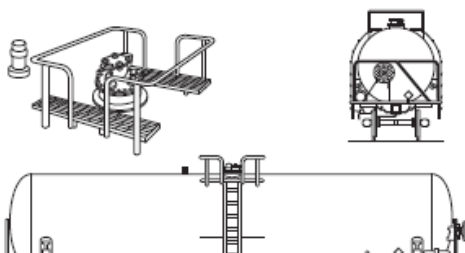
The recommended guides should be considered as last resort if the material cannot be identified by any other means.

117 Pressure tank car



- For flammable, non-flammable, toxic and/or liquefied compressed gases
- Protective housing
- No bottom fittings
- Pressures usually above 40 psi

131 Non-pressure / low pressure tank car



- Known as **general service tank car**
- For variety of hazardous and non-hazardous materials
- Fittings and valves normally visible at the top of the tank
- Some may have bottom outlet valve
- Pressures usually below 25 psi

ROAD TRAILER IDENTIFICATION CHART

CAUTION: This chart depicts only the most general shapes of road trailers and cargo transport units. Emergency response personnel must be aware that there are many variations of road trailers, not illustrated below, that are used for shipping chemical products. Many intermodal tanks that transport liquids, solids, liquefied compressed gases, and refrigerated liquefied gases have similar silhouettes. The suggested guides are for the most hazardous products that may be transported in these trailer types.

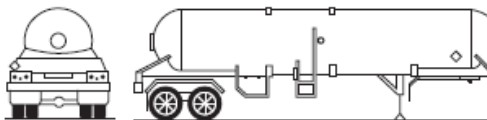
WARNING: Road trailers may be jacketed, the cross-section may look different than shown and external ring stiffeners would be invisible.

NOTE: An emergency shut-off valve is commonly found at the front of the tank, near the driver door.

The recommended guides should be considered as last resort if the material cannot be identified by any other means.

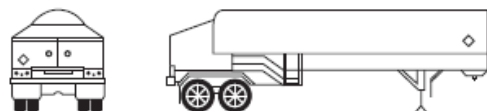
MAWP: Maximum Allowable Working Pressure.

117 MC331, TC331, SCT331



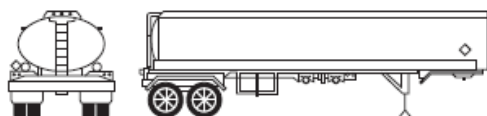
- For liquefied compressed gases (e.g., LPG, ammonia)
- Rounded heads
- Design pressure between 100-500 psi

117 MC338, TC338, SCT338, TC341, CGA341



- For refrigerated liquefied gases (cryogenic liquids)
- Similar to a "giant thermo-bottle"
- Fitting compartments located in a cabinet at the rear of the tank
- MAWP between 25-500 psi

131 DOT406, TC406, SCT306, MC306, TC306



- For flammable liquids (e.g., gasoline, diesel)
- Elliptical cross-section
- Rollover protection at the top
- Bottom outlet valves
- MAWP between 3-15 psi

White Pages – Last resort

GUIDE MIXED LOAD/UNIDENTIFIED CARGO 111

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.
- Vapors 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 or dilution water may cause environmental contamination.

PUBLIC SAFETY

- **CALL 911. Then call emergency response telephone number on shipping paper.** If shipping paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
- 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 thermal protection **but only limited chemical protection.**

EVACUATION

Immediate precautionary measure

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

Fire

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

MIXED LOAD/UNIDENTIFIED CARGO GUIDE 111

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.
- If it can be done safely, move undamaged containers away from the area around the fire.

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 discoloration 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) from 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 vapors or divert vapor 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.

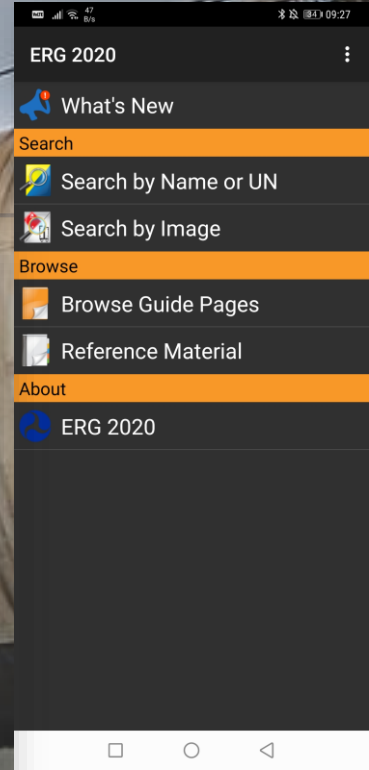
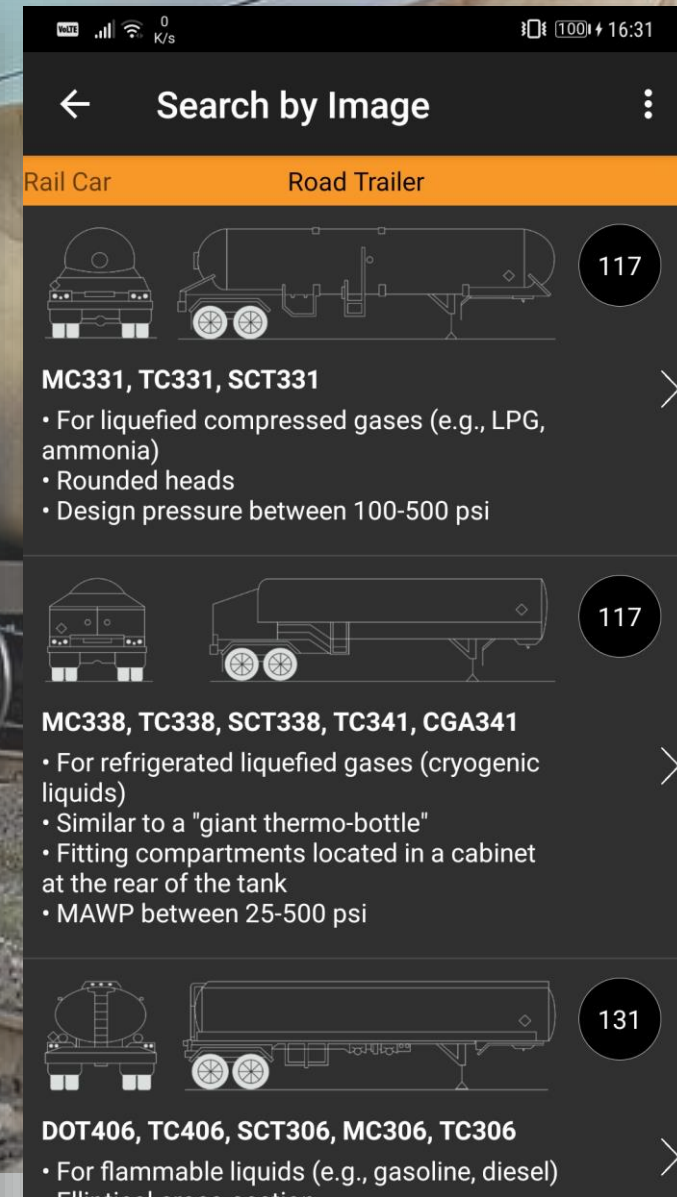
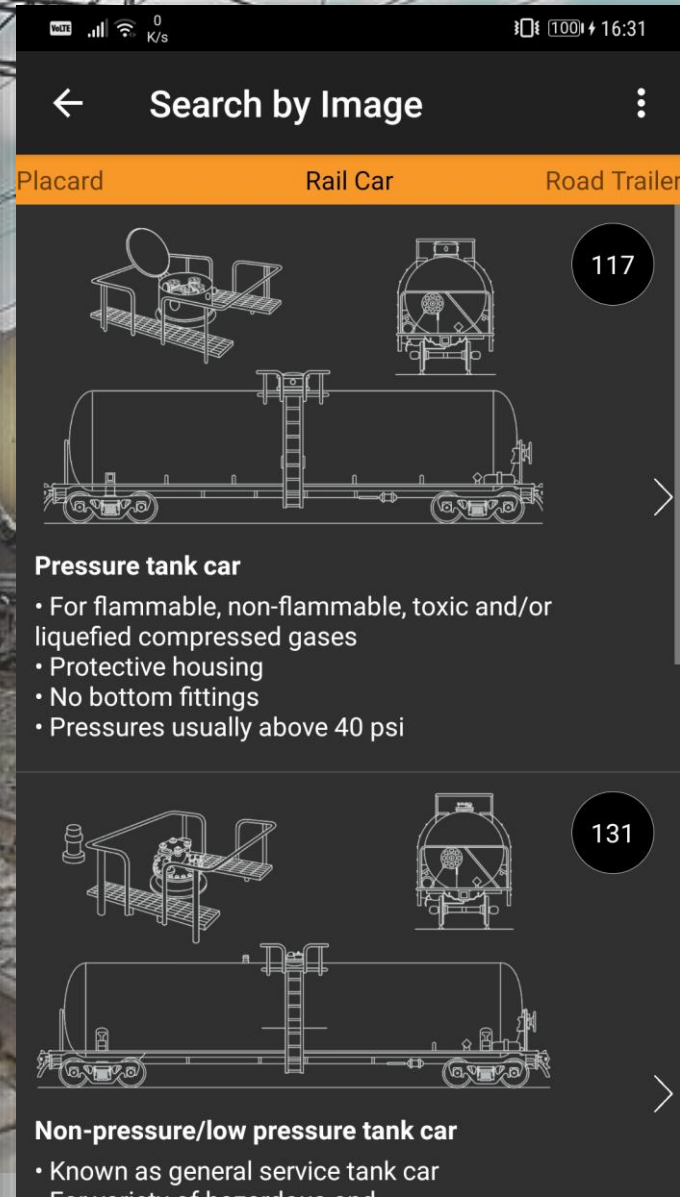
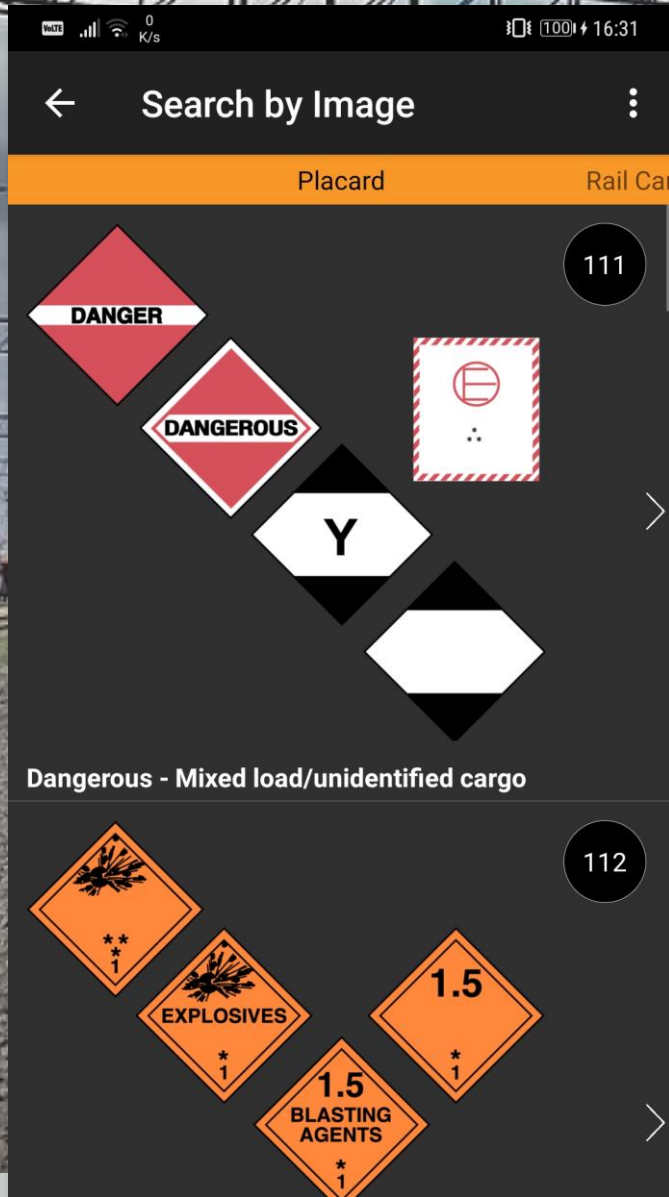
Large Spill

- Dike far ahead of liquid spill for later disposal.

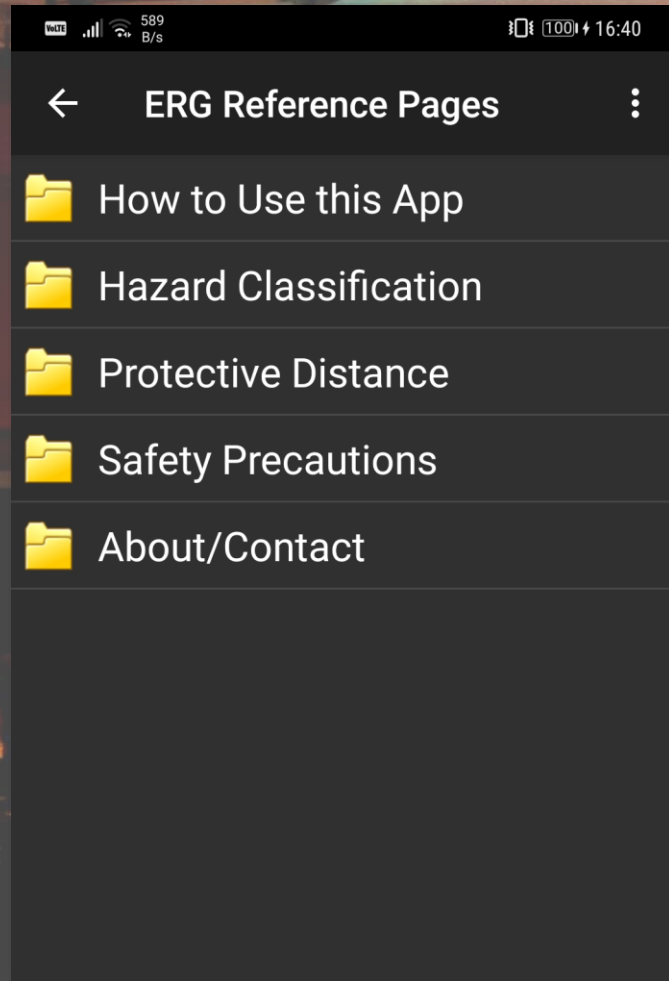
FIRST AID

- Call 911 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.
- **Do not perform mouth-to-mouth resuscitation if victim ingested or inhaled the substance; wash face and mouth before giving artificial respiration. Use 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.

White Pages – Last resort



Reference Pages



WARNING: 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)

Capacity	Diameter	Length	Propane Mass	Minimum time to failure for severe torch	Approximate time to empty for engulfing fire	Fireball radius	Emergency response distance	Minimum evacuation distance	Preferred evacuation distance	Cooling water flow rate	
Litres (Gallons)	Meters (Feet)	Meters (Feet)	Kilograms(Pounds)	Minutes	Minutes	Meters (Feet)	Meters (Feet)	Meters (Feet)	Meters (Feet)	Litres/min	USgal/min
100 (26.4)	0.3 (1)	1.5 (4.9)	40 (88)	4	8	10 (33)	90 (295)	154 (505)	307 (1007)	97	26
400 (106)	0.61 (2)	1.5 (4.9)	160 (353)	4	12	16 (53)	90 (295)	244 (801)	488 (1601)	195	51
2000 (528)	0.96 (3.2)										

Improvised Explosive Device (IED) SAFE STAND-OFF DISTANCE

Threat Description		Explosives Capacity ¹		Mandatory Evacuation Distance ²		Shelter-in-Place Zone		Preferred Evacuation Distance ³	
High Explosives (TNT Equivalent)	Pipe Bomb	5 lbs	2.3 kg	70 ft	21 m	71 - 1,199 ft	22 - 365 m	+1,200 ft	366 m
	Suicide Bomber	20 lbs	9 kg	110 ft	34 m	111 - 1,699 ft	35 - 518 m	+1,700 ft	519 m
	Briefcase/Suitcase	50 lbs	23 kg	150 ft	46 m	151 - 1,849 ft	47 - 563 m	+1,850 ft	564 m
	Car	500 lbs	227 kg	320 ft	98 m	321 - 1,899 ft	99 - 579 m	+1,900 ft	580 m
	SUV/Van	1,000 lbs	454 kg	400 ft	122 m	401 - 2,399 ft	123 - 731 m	+2,400 ft	732 m
	Small Delivery Truck	4,000 lbs	1,814 kg	640 ft	195 m	641 - 3,799 ft	196 - 1,158 m	+3,800 ft	1,159 m
	Container/Water Truck	10,000 lbs	4,536 kg	860 ft	263 m	861 - 5,099 ft	264 - 1,554 m	+5,100 ft	1,555 m
	Semi-Trailer	60,000 lbs	27,216 kg	1,570 ft	475 m	1,571 - 9,299 ft	476 - 2,834 m	+9,300 ft	2,835 m

¹ Based on the maximum amount of material that could reasonably fit into a container or vehicle. Variations possible.

² Governed by the ability of an unreinforced building to withstand severe damage or collapse.

³ 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.

Chemsafe

ChemData



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Any Questions?