

UNEP-ICCA Project “Promoting Chemical Safety Management in the African Region”

Training Workshop on Emergency Preparedness and Dangerous Goods Handling

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Colorado Emergency Planning Commission



ERG2012

The Emergency Response Guidebook 2012 (ERG2012) is primarily a guide to aid 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.

Before an emergency – become familiar with this guidebook!



Overview of the ERG2012

The main sections are:

- Table of placards (pages 6-7)
- Railcar & Trailer Identification charts (pages 8-9)
- **YELLOW** section (ID numbers)
- **BLUE** section (names of material)
- **ORANGE** section (guide pages)
- **GREEN** section (initial isolation and protective action distances for highlighted substances)



Overview of the ERG2012

The new sections are

- **TABLE 3** - Initial Isolation and Protective Action Distances for Different Quantities of Six Common TIH Gases (pages 352-355)
- BLEVE - Boiling Liquid Expanding Vapour Explosion (pages 364- 367)
- Improvised Explosive Device - IED (page 372)

TIH: Toxic Inhalation Hazard



Additional Sections

Other ERG2012 sections, not covered in the presentation, but suggested for reading:

- Shipping Documents (inside front page cover)
- Safety Precautions (page 2)
- Hazard Classification System (page 4)
- Hazard Identification Numbers Displayed on Some Intermodal Containers (pages 10-13)
- Pipeline Transportation (pages 14-19)
- Protective Actions (pages 287-288)
- Protective Clothing (pages 361-362)
- Fire and Spill Control (pages 363-364)
- Criminal / Terrorist Use of Chemical / Biological / Radiological Agents (pages 368-371)
- Glossary (pages 374-382)



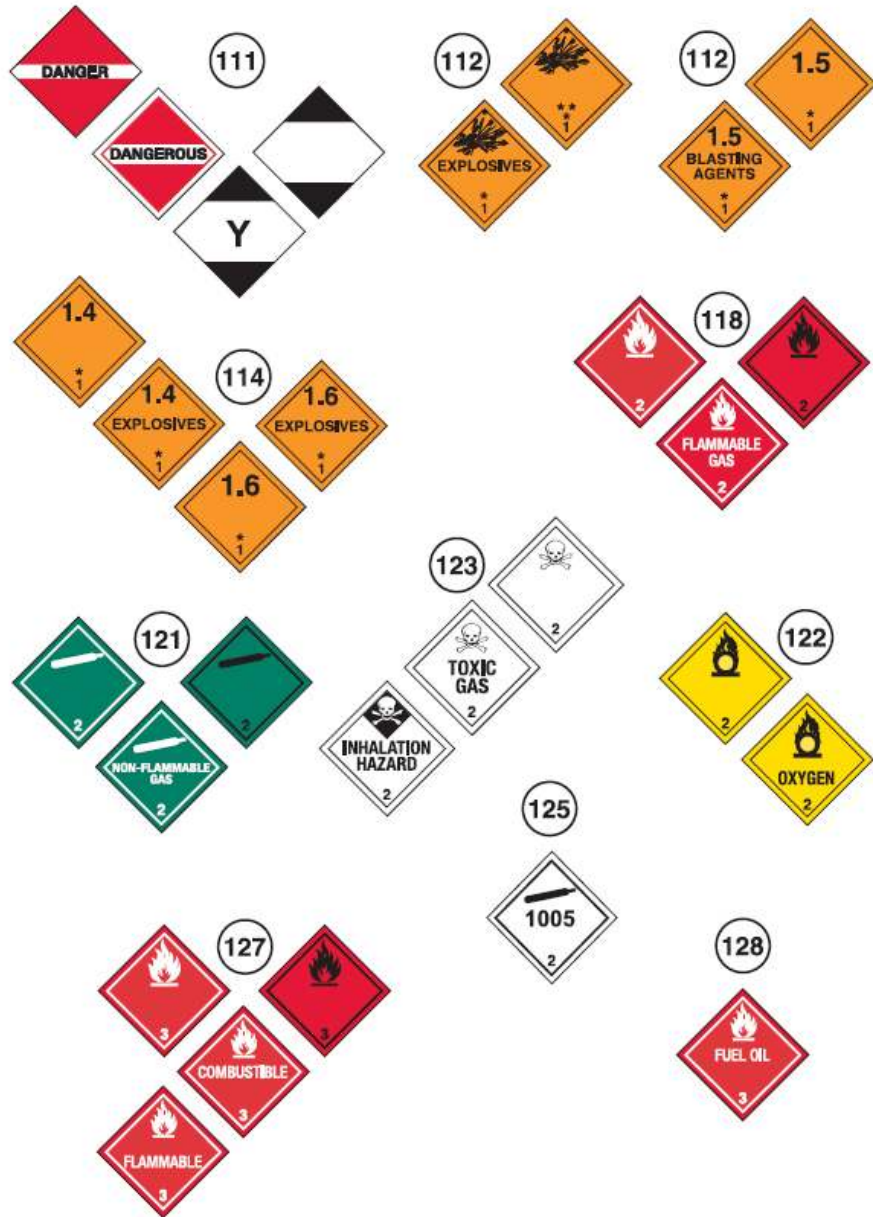
Table of Placards

- The different placards used in the transport of dangerous goods are found on pages 6 and 7 of the ERG2012.
- Each group of placards is associated to a 3-digit guide number (**ORANGE** section).

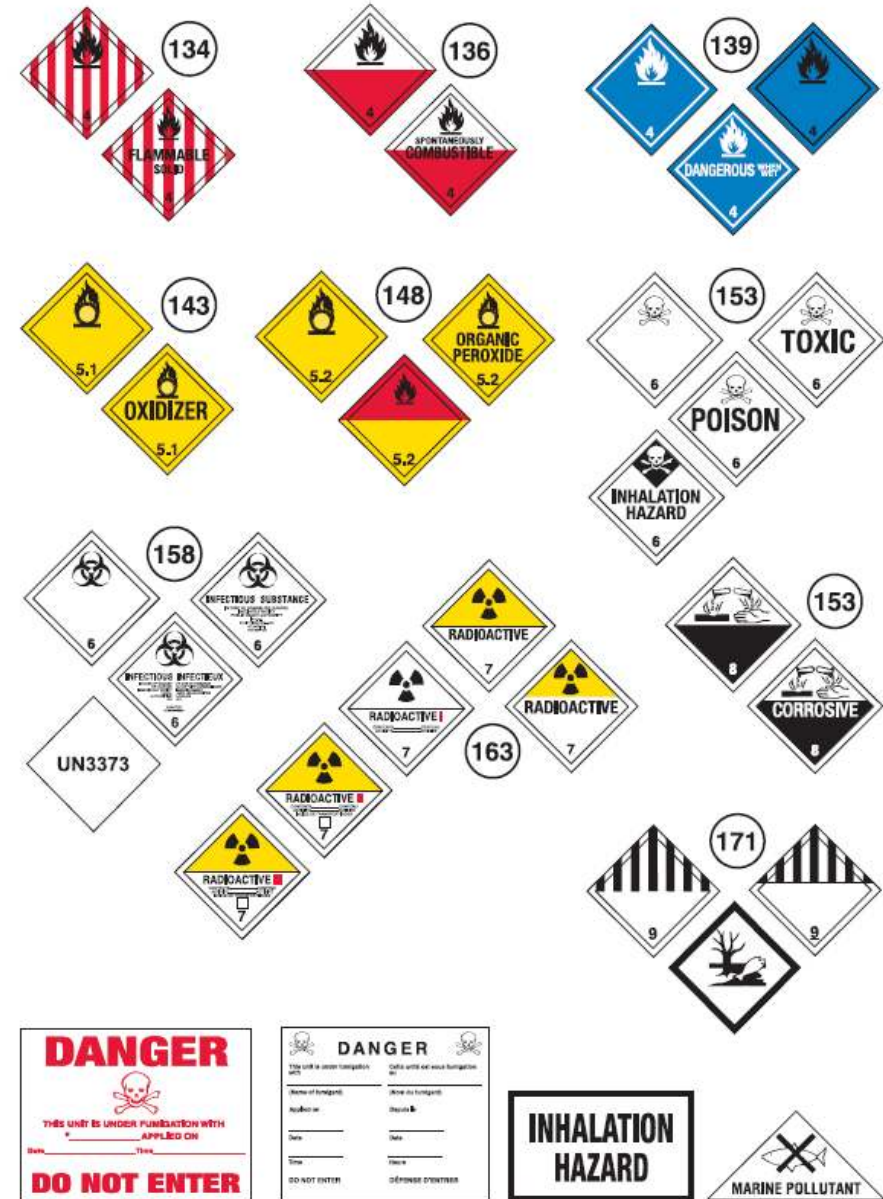
Caution: The recommended guides should be considered as a last resort if the material cannot be identified by any other means.



TABLE OF PLACARDS AND INITIAL
 USE THIS TABLE ONLY IF MATERIALS CANNOT BE SPECIFICALLY IDENTIFIED BY



RESPONSE GUIDE TO USE ON-SCENE
 USING THE SHIPPING DOCUMENT, NUMBERED PLACARD, OR ORANGE PANEL NUMBER



Rail Car and Road Trailer ID Charts

- Pages 8 and 9 of the ERG2012 depict the general shapes of railcars and road trailers used in the transportation of dangerous goods.
- Each shape is associated to a 3-digit guide number (**ORANGE** section).

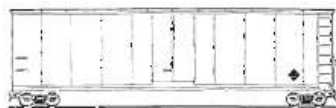
Caution: The recommended guides should be considered as a last resort if the material cannot be identified by any other means.



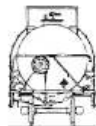
RAIL CAR IDENTIFICATION CHART*



Hopper Car
Dry Bulk (140)



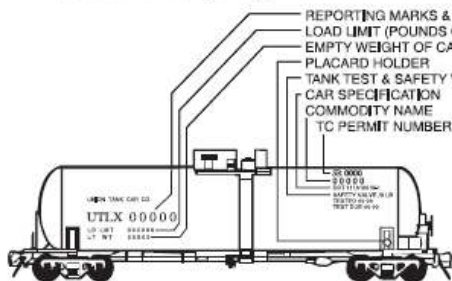
Box Car
Mixed Cargo (111)



Pressure Tank Car
Compressed Liquefied Gases
(Closed Dome Only on top) (117)



Low Pressure Tank Car
Liquids
(Closed Dome and Outlets on top) (131)



REPORTING MARKS & CAR NUMBER
LOAD LIMIT (POUNDS OR KG)
EMPTY WEIGHT OF CAR
PLACARD HOLDER
TANK TEST & SAFETY VALVE TEST INFORMATION
CAR SPECIFICATION
COMMODITY NAME
TC PERMIT NUMBER



REPORTING MARKS & CAR NUMBER
CAPACITY IN GALLONS OR LITERS
PLACARD HOLDER

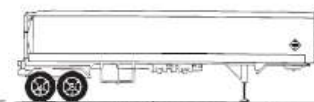
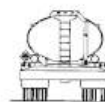
CAUTION: Emergency response personnel must be aware that rail tank cars vary widely in construction, fittings and purpose. Tank cars could transport products that may be solids, liquids or gases. The products may be under pressure. It is essential that products be identified by consulting shipping documents 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 above, may be used to identify the product utilizing:

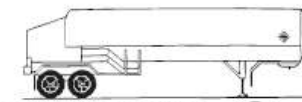
- the commodity name shown; or
- the other information shown, especially reporting marks and car number which, when supplied to a dispatch center, will facilitate the identification of the product.

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

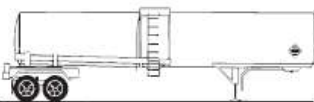
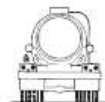
ROAD TRAILER IDENTIFICATION CHART*



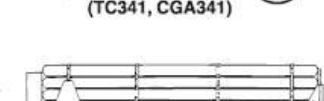
DOT406, TC406, SCT-306
Non-pressure Liquid Tank
(MC306, TC306) (131)



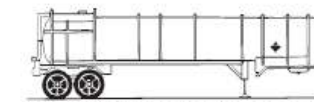
MC338, TC338, SCT-338
Cryogenic Liquid Tank
(TC341, CGA341) (117)



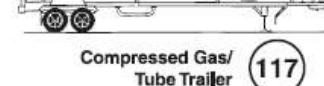
DOT407, TC407, SCT-307
Low Pressure Chemical Tank
(MC307, TC307) (137)



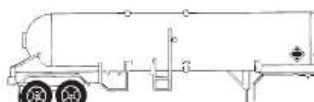
Compressed Gas/
Tube Trailer (117)



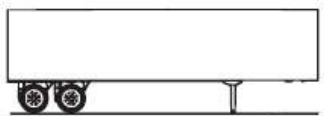
DOT412, TC412, SCT-312
Corrosive Liquid Tank
(MC312, TC312) (137)



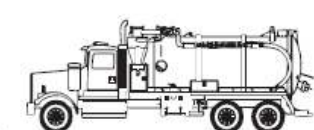
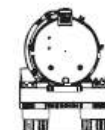
Dry Bulk Cargo
Trailer (134)



MC331, TC331, SCT-331
High Pressure Tank (117)



Mixed Cargo (111)



DOT407, TC407, DOT412, TC412
Vacuum Loaded Tank
(TC350) (137)



Intermodal Tank (117)

CAUTION: This chart depicts only the most general shapes of road trailers. Emergency response personnel must be aware that there are many variations of road trailers, not illustrated above, that are used for shipping chemical products. The suggested guides are for the most hazardous products that may be transported in these trailer types.

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

YELLOW Section

- In this section, the substances are listed in numerical order of their 4-digit ID Numbers.
- The ID Number is followed by the 3-digit guide number (**ORANGE** section) to refer to, as well as the name of material.
- Please note that some substances are highlighted in **GREEN** and should be treated specifically.



ID No.	Guide No.	Name of Material	ID No.	Guide No.	Name of Material	ID No.	Guide No.	Name of Material	ID No.	Guide No.	Name of Material
1035	115	Ethane	1050	125	Hydrogen chloride, anhydrous	1066	121	Nitrogen, compressed	1079	125	Sulfur dioxide
1035	115	Ethane, compressed	1051	117	AC	1067	124	Dinitrogen tetroxide	1079	125	Sulphur dioxide
1036	118	Ethylamine	1051	117	Hydrocyanic acid, aqueous solutions, with more than 20% Hydrogen cyanide	1067	124	Nitrogen dioxide	1080	126	Sulfur hexafluoride
1037	115	Ethyl chloride	1051	117	Hydrogen cyanide, anhydrous, stabilized	1069	125	Nitrosyl chloride	1080	126	Sulphur hexafluoride
1038	115	Ethylene, refrigerated liquid (cryogenic liquid)	1051	117	Hydrogen cyanide, stabilized	1070	122	Nitrous oxide	1081	116P	Tetrafluoroethylene, stabilized
1039	115	Ethyl methyl ether	1052	125	Hydrogen fluoride, anhydrous	1070	122	Nitrous oxide, compressed	1082	119P	Trifluorochloroethylene, stabilized
1039	115	Methyl ethyl ether	1053	117	Hydrogen sulfide	1071	119	Oil gas	1083	118	Trimethylamine, anhydrous
1040	119P	Ethylene oxide	1053	117	Hydrogen sulphide	1071	119	Oil gas, compressed	1085	116P	Vinyl bromide, stabilized
1040	119P	Ethylene oxide with Nitrogen	1055	115	Isobutylene	1072	122	Oxygen	1086	116P	Vinyl chloride, stabilized
1041	115	Carbon dioxide and Ethylene oxide mixture, with more than 9% but not more than 87% Ethylene oxide	1056	121	Krypton	1072	122	Oxygen, compressed	1087	116P	Vinyl methyl ether, stabilized
1041	115	Carbon dioxide and Ethylene oxide mixtures, with more than 6% Ethylene oxide	1056	121	Krypton, compressed	1073	122	Oxygen, refrigerated liquid (cryogenic liquid)	1088	127	Acetal
1041	115	Ethylene oxide and Carbon dioxide mixture, with more than 9% but not more than 87% Ethylene oxide	1057	115	Lighter refills (cigarettes) (flammable gas)	1075	115	Butane	1089	129	Acetaldehyde
1041	115	Ethylene oxide and Carbon dioxide mixtures, with more than 6% Ethylene oxide	1057	115	Lighters (cigarettes) (flammable gas)	1075	115	Butane mixture	1090	127	Acetone
1043	125	Fertilizer, ammoniating solution, with free Ammonia	1058	120	Liquefied gases, non-flammable, charged with Nitrogen, Carbon dioxide or Air	1075	115	Butylene	1091	127	Acetone oils
1044	126	Fire extinguishers with compressed gas	1060	116P	Methylacetylene and Propadiene mixture, stabilized	1075	115	Isobutane	1092	131P	Acrolein, stabilized
1044	126	Fire extinguishers with liquefied gas	1060	116P	Propadiene and Methylacetylene mixture, stabilized	1075	115	Isobutane mixture	1093	131P	Acrylonitrile, stabilized
1045	124	Fluorine	1061	118	Methylamine, anhydrous	1075	115	Isobutylene	1098	131	Allyl alcohol
1045	124	Fluorine, compressed	1062	123	Methyl bromide	1075	115	Liquefied petroleum gas	1099	131	Allyl bromide
1046	121	Helium	1063	115	Methyl chloride	1075	115	LPG	1100	131	Allyl chloride
1046	121	Helium, compressed	1063	115	Refrigerant gas R-40	1075	115	Petroleum gases, liquefied	1104	129	Amyl acetates
1048	125	Hydrogen bromide, anhydrous	1064	117	Methyl mercaptan	1075	115	Propane	1105	129	Amyl alcohols
1049	115	Hydrogen	1065	121	Neon	1075	115	Propane mixture	1105	129	Pentanol
1049	115	Hydrogen, compressed	1065	121	Neon, compressed	1075	115	Propylene	1106	132	Amylamines
			1066	121	Nitrogen	1076	125	CG	1107	129	Amyl chloride
						1076	125	Diphosgene	1108	128	n-Amylene
						1076	125	DP	1108	128	1-Pentene
						1076	125	Phosgene	1109	129	Amyl formates
						1077	115	Propylene	1110	127	n-Amyl methyl ketone
						1078	126	Dispersant gas, n.o.s.	1110	127	Amyl methyl ketone
						1078	126	Refrigerant gas, n.o.s.	1110	127	Methyl amyl ketone

BLUE Section

- In this section, the substances are listed in alphabetical order of material name.
- The name of the material is followed by the 3-digit guide number (**ORANGE** section) to refer to, as well as the ID Number.
- Please note that some substances are highlighted in **GREEN** and thus will have to be treated specifically.



Name of Material	Guide No.	ID No.	Name of Material	Guide No.	ID No.	Name of Material	Guide No.	ID No.	Name of Material	Guide No.	ID No.
Alcohols, toxic, n.o.s.	131	1986	Alkaloid salts, liquid, n.o.s. (poisonous)	151	3140	Allyl bromide	131	1099	Aluminum remelting by-products	138	3170
Aldehydes, flammable, poisonous, n.o.s.	131	1988	Alkaloid salts, solid, n.o.s. (poisonous)	151	1544	Allyl chloride	131	1100	Aluminum resinate	133	2715
Aldehydes, flammable, toxic, n.o.s.	131	1988	Alkylamines, n.o.s.	132	2733	Allyl chlorocarbonate	155	1722	Aluminum silicon powder, uncoated	138	1398
Aldehydes, n.o.s.	129	1989	Alkylamines, n.o.s.	132	2734	Allyl chloroformate	155	1722	Aluminum smelting by-products	138	3170
Aldehydes, poisonous, n.o.s.	131	1988	Alkylamines, n.o.s.	153	2735	Allyl ethyl ether	131	2335	Amines, flammable, corrosive, n.o.s.	132	2733
Aldehydes, toxic, n.o.s.	131	1988	Alkyl phenols, liquid, n.o.s. (including C2-C12 homologues)	153	3145	Allyl formate	131	2336	Amines, liquid, corrosive, flammable, n.o.s.	132	2734
Aldol	153	2839	Alkyl phenols, solid, n.o.s. (including C2-C12 homologues)	153	2430	Allyl glycidyl ether	129	2219	Amines, liquid, corrosive, n.o.s.	153	2735
Alkali metal alcoholates, self-heating, corrosive, n.o.s.	136	3206	Alkyl sulfonic acids, liquid, with more than 5% free Sulfuric acid	153	2584	Allyl iodide	132	1723	Amines, solid, corrosive, n.o.s.	154	3259
Alkali metal alloy, liquid, n.o.s.	138	1421	Alkyl sulfonic acids, liquid, with not more than 5% free Sulfuric acid	153	2586	Allyl isothiocyanate, stabilized	155	1545	2-Amino-4-chlorophenol	151	2673
Alkali metal amalgam	138	1389	Alkyl sulfonic acids, solid, with more than 5% free Sulfuric acid	153	2583	Allyltrichlorosilane, stabilized	155	1724	2-Amino-5-diethylaminopentane	153	2946
Alkali metal amalgam, liquid	138	1389	Alkyl sulfonic acids, solid, with not more than 5% free Sulfuric acid	153	2585	Aluminum, molten	169	9260	2-Amino-4,6-dinitrophenol, wetted with not less than 20% water	113	3317
Alkali metal amalgam, solid	138	1389	Alkylsulfuric acids	156	2571	Aluminum alkyl halides	135	3052	2-(2-Aminoethoxy)ethanol	154	3055
Alkali metal amides	139	1390	Alkyl sulphonic acids, liquid, with more than 5% free Sulphuric acid	153	2586	Aluminum alkyl halides, liquid	135	3052	N-Aminoethylpiperazine	153	2815
Alkali metal dispersion	138	1391	Alkyl sulphonic acids, liquid, with not more than 5% free Sulphuric acid	153	2583	Aluminum alkyl halides, solid	135	3052	Aminophenols	152	2512
Alkali metal dispersion, flammable	138	3482	Alkyl sulphonic acids, solid, with not more than 5% free Sulphuric acid	153	2585	Aluminum alkyl halides, solid	135	3461	Aminopyridines	153	2671
Alkaline earth metal alcoholates, n.o.s.	135	3205	Alkylsulphuric acids	156	2571	Aluminum alkyl hydrides	138	3076	Ammonia, anhydrous	125	1005
Alkaline earth metal alloy, n.o.s.	138	1393	Allyl acetate	131	2333	Aluminum alkyls	135	3051	Ammonia, solution, with more than 10% but not more than 35% Ammonia	154	2672
Alkaline earth metal amalgam	138	1392	Allyl alcohol	131	1098	Aluminum borohydride	135	2870	Ammonia, solution, with more than 35% but not more than 50% Ammonia	125	2073
Alkaline earth metal amalgam, liquid	138	1392	Allylamine	131	2334	Aluminum borohydride in devices	135	2870	Ammonia solution, with more than 50% Ammonia	125	3318
Alkaline earth metal amalgam, solid	138	3402				Aluminum bromide, anhydrous	137	1725	Ammonium arsenate	151	1546
Alkaline earth metal dispersion	138	1391				Aluminum bromide, solution	154	2580	Ammonium bifluoride, solid	154	1727
Alkaline earth metal dispersion, flammable	138	3482				Aluminum carbide	138	1394	Ammonium bifluoride, solution	154	2817
Alkaloids, liquid, n.o.s. (poisonous)	151	3140				Aluminum chloride, anhydrous	137	1726	Ammonium dichromate	141	1439
Alkaloids, solid, n.o.s. (poisonous)	151	1544				Aluminum chloride, solution	154	2581	Ammonium dinitro-o-cresolate	141	1843
						Aluminum dross	138	3170			
						Aluminum ferrosilicon powder	139	1395			
						Aluminum hydride	138	2463			
						Aluminum nitrate	140	1438			
						Aluminum phosphide	139	1397			
						Aluminum phosphide pesticide	157	3048			
						Aluminum powder, coated	170	1309			
						Aluminum powder, pyrophoric	135	1383			
						Aluminum powder, uncoated	138	1396			
						Aluminum processing by-products	138	3170			

Letter “P”

In the **YELLOW** and **BLUE** Sections:

- If the 3-digit guide number is supplemented with the letter “P” (ex. 116P), the material may undergo violent polymerization if subjected to heat or contamination.

This polymerization will produce heat and high pressure buildup in containers which may explode or rupture.



ORANGE Section

- This section contains all the guides needed for the initial response phase of an incident involving dangerous goods.
- Each Guide covers a *range* of products, which present similar hazards;
 - 36 **ORANGE** guides refer only to non-highlighted substances (non-TIH);
 - 21 **ORANGE** guides refer to both highlighted and non-highlighted substances (TIH and non-TIH);
 - 5 **ORANGE** guides refer only to highlighted substances (TIH).

TIH: Toxic Inhalation Hazard



POTENTIAL HAZARDS

FIRE OR EXPLOSION

- **HIGHLY FLAMMABLE:** Will be easily ignited by heat, sparks or flames.
- Vapors may form explosive mixtures with air.
- Vapors may travel to source of ignition and flash back.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Vapor 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 UN3166, if Lithium ion batteries are involved, also consult GUIDE 147.
- **If molten aluminum is involved, refer to GUIDE 169.**

HEALTH

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

PUBLIC SAFETY

- **CALL EMERGENCY RESPONSE Telephone Number on Shipping Paper first. If Shipping Paper 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 50 meters (150 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind.
- Keep out of low areas.
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING

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

EVACUATION

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

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 vapor suppressing foam may be used to reduce vapors.
- 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 vapor; but may not prevent ignition in closed spaces.

FIRST AID

- Move victim to fresh air.
- Call 911 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 warm and quiet.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

ORANGE Section

The ***Public Safety*** section provides:

- A suggested isolation area, as an immediate precautionary measure, irrespectively of the quantity involved.

The ***Evacuation*** subsection provides:

- A suggested evacuation perimeter for large spill or fire situations AND/OR
- The reference to **Table 1** - Initial Isolation and Protective Action Distances (**GREEN** section).



Isolation Distances / Evacuation

In the **YELLOW** and **BLUE** sections, if the substance is not highlighted in **GREEN**:

- Use the distances suggested in the **ORANGE** section:
 - Isolate the area in all directions, as an immediate precautionary measure, to the minimum distance suggested under *Public Safety*, and increase the zone if needed;
 - Consider the evacuation distances suggested in the subsection *Evacuation – Spill / Fire*.



Isolation Distances / Evacuation

In the **YELLOW** and **BLUE** sections, if the substance is highlighted in GREEN:

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

- **IF THERE IS A FIRE or A FIRE IS INVOLVED:**
 - Also consult the assigned **ORANGE** guide
 - If applicable, apply the evacuation information shown under the ***Public Safety*** section



GREEN Section

This section contains the following tables:

- **TABLE 1** – Initial Isolation and Protective Action Distances
- **TABLE 2** – Water-Reactive Materials which Produce Toxic Gases
- **TABLE 3** – Initial Isolation and Protective Action Distances for Different Quantities of Six Common TIH Gases



Table 1

TABLE 1 - Initial Isolation and Protective Action Distances

suggests distances useful to protect people from vapours resulting from spills involving dangerous goods that are considered :

- toxic by inhalation (TIH),
- chemical warfare agents and
- materials that produce toxic gases upon contact with water.

In this table, the substances are presented in numerical order of their ID numbers. An asterisk (*) next to the ID number indicates to consult **Table 3** for more information.



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 Meters (Feet)		Then PROTECT persons Downwind during-				First ISOLATE in all Directions Meters (Feet)		Then PROTECT persons Downwind during-			
					DAY Kilometers (Miles)		NIGHT Kilometers (Miles)				DAY Kilometers (Miles)		NIGHT Kilometers (Miles)	
1005 *	125	Ammonia, anhydrous	30 m	(100 ft)	0.1 km	(0.1 mi)	0.2 km	(0.1 mi)	150 m	(500 ft)	0.8 km	(0.5 mi)	2.0 km	(1.3 mi)
1005 *	125	Anhydrous ammonia												
1008	125	Boron trifluoride	30 m	(100 ft)	0.1 km	(0.1 mi)	0.5 km	(0.4 mi)	300 m	(1000 ft)	1.7 km	(1.1 mi)	4.8 km	(3.0 mi)
1008	125	Boron trifluoride, compressed												
1016	119	Carbon monoxide	30 m	(100 ft)	0.1 km	(0.1 mi)	0.2 km	(0.1 mi)	200 m	(600 ft)	1.2 km	(0.8 mi)	4.8 km	(3.0 mi)
1016	119	Carbon monoxide, compressed												
1017 *	124	Chlorine	60 m	(200 ft)	0.4 km	(0.2 mi)	1.5 km	(1.0 mi)	500 m	(1500 ft)	3.0 km	(1.9 mi)	7.9 km	(4.9 mi)
1023	119	Coal gas	60 m	(200 ft)	0.2 km	(0.1 mi)	0.2 km	(0.1 mi)	100 m	(300 ft)	0.4 km	(0.2 mi)	0.5 km	(0.3 mi)
1023	119	Coal gas, compressed												
1026	119	Cyanogen	30 m	(100 ft)	0.1 km	(0.1 mi)	0.5 km	(0.3 mi)	60 m	(200 ft)	0.4 km	(0.2 mi)	1.7 km	(1.0 mi)
1026	119	Cyanogen gas												
1040 *	119P	Ethylene oxide	30 m	(100 ft)	0.1 km	(0.1 mi)	0.2 km	(0.1 mi)	150 m	(500 ft)	0.9 km	(0.5 mi)	2.0 km	(1.3 mi)
1040 *	119P	Ethylene oxide with Nitrogen												
1045	124	Fluorine	30 m	(100 ft)	0.1 km	(0.1 mi)	0.2 km	(0.1 mi)	100 m	(300 ft)	0.5 km	(0.3 mi)	2.3 km	(1.4 mi)
1045	124	Fluorine, compressed												
1048	125	Hydrogen bromide, anhydrous	30 m	(100 ft)	0.1 km	(0.1 mi)	0.3 km	(0.2 mi)	200 m	(600 ft)	1.2 km	(0.8 mi)	3.9 km	(2.4 mi)
1050 *	125	Hydrogen chloride, anhydrous	30 m	(100 ft)	0.1 km	(0.1 mi)	0.3 km	(0.2 mi)	60 m	(200 ft)	0.3 km	(0.2 mi)	1.3 km	(0.8 mi)
1051	117	AC (when used as a weapon)	60 m	(200 ft)	0.3 km	(0.2 mi)	1.0 km	(0.6 mi)	1000 m	(3000 ft)	3.7 km	(2.3 mi)	8.4 km	(5.3 mi)

Table 1

This table provides, for small and large spills, the distances for:

- The Initial Isolation Zone and,
- The suggested Protective Action Zone, **downwind**, for **day** and **night**.

The distances show the areas likely to be affected during the first 30 minutes after the materials are spilled, and this distance could increase with time.

The responders must choose a protective actions: evacuation, shelter in place or a combination of both (see page 288 of the ERG2012).



Small and large spills

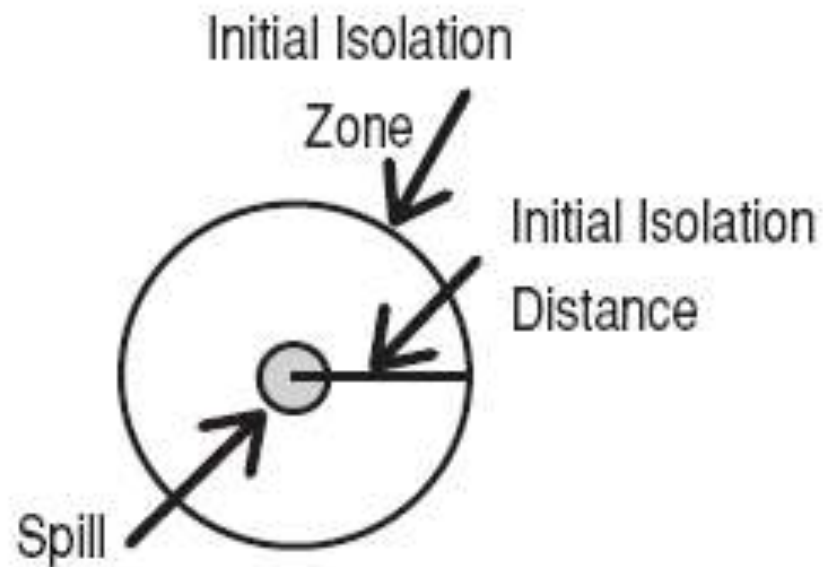
The definitions are:

- **Small Spill:** A spill that involves quantities that are less than 208 litres (55 U.S. Gallons) for liquids and less than 300 kilograms (660 pounds) for solids. Generally involves a single small package, a small cylinder, or a small leak from a large package.
- **Large Spill:** A spill that involves quantities that are greater than 208 litres (55 U.S. Gallons) for liquids and greater than 300 kilograms (660 pounds) for solids. Generally involves a spill from a large package, or multiple spills from many small packages.
- For any intermediate quantity, the distances would need to be estimated between the distances provided for small and large spills.



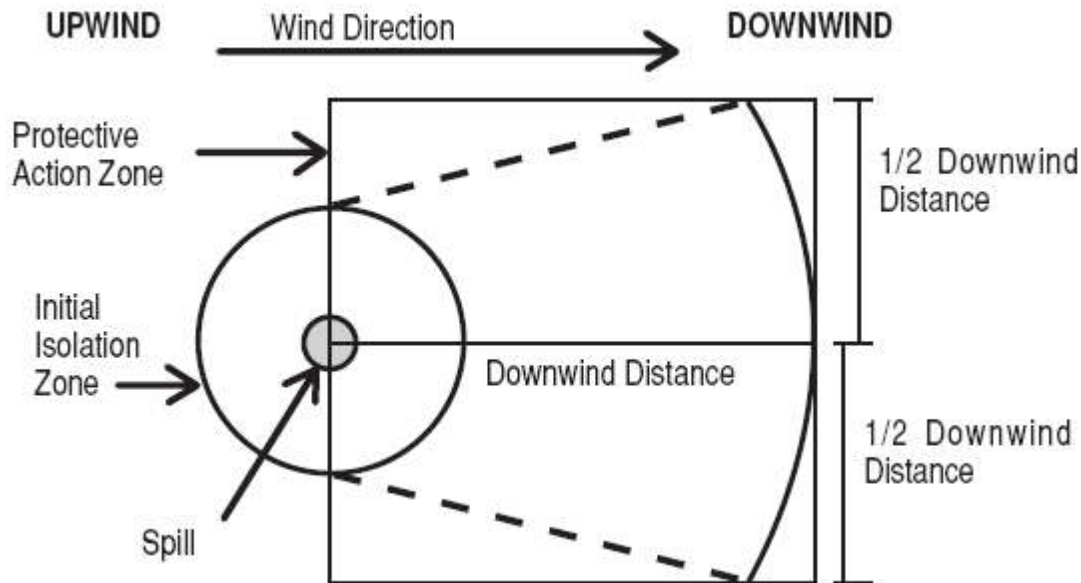
Initial Isolation Zone

Defines an area SURROUNDING the incident in which persons may be exposed to dangerous (upwind) and life threatening (downwind) concentrations of material.



Protective Action Zone

Defines an area DOWNWIND from the incident in which persons may become incapacitated, unable to take protective action or incur serious health effects. The shape of the area in which protective should be taken actions (the Protective Action Zone) is shown in the figure below.



Protective Action Zone

It is important to note that Protective Action Zones do not only depend on the presence of gases/vapours but mainly on the concentration in the air :

- During the day, there is an increase of the atmospheric disturbances creating a greater dispersion (dilution) of the gases/vapours, which results in a weaker toxic concentration in the air and thus requires a smaller Protective Action Zone than at night.
- During the night, the gases/vapours will calmly dissipate. This will result in a higher toxic concentration in the air and consequently, necessitate a greater Protective Action Zone.



Table 2

TABLE 2 – Water-Reactive Materials which Produce Toxic Gases contains:

- A list of materials which produce large amount of Toxic Inhalation Hazard (TIH) gases when spilled in water and identifies the TIH gases produced.
- The substances are presented in numerical order of their ID Numbers.

These Water Reactive materials are easily identified in **Table 1** as their name is immediately followed by *(when spilled in water)*.



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

ID No.	Guide No.	Name of Material	TIH Gas(es) Produced
1716	156	Acetyl bromide	HBr
1717	155	Acetyl chloride	HCl
1724	155	Allyltrichlorosilane, stabilized	HCl
1725	137	Aluminum bromide, anhydrous	HBr
1726	137	Aluminum chloride, anhydrous	HCl
1728	155	Amyltrichlorosilane	HCl
1732	157	Antimony pentafluoride	HF
1741	125	Boron trichloride	HCl
1745	144	Bromine pentafluoride	HF Br ₂
1746	144	Bromine trifluoride	HF Br ₂
1747	155	Butyltrichlorosilane	HCl
1752	156	Chloroacetyl chloride	HCl
1753	156	Chlorophenyltrichlorosilane	HCl
1754	137	Chlorosulfonic acid	HCl
1754	137	Chlorosulfonic acid and Sulfur trioxide mixture	HCl
1754	137	Chlorosulphonic acid	HCl
1754	137	Chlorosulphonic acid and Sulphur trioxide mixture	HCl
1754	137	Sulfur trioxide and Chlorosulfonic acid	HCl
1754	137	Sulphur trioxide and Chlorosulphonic acid	HCl
1758	137	Chromium oxychloride	HCl
1762	156	Cyclohexenyltrichlorosilane	HCl
1763	156	Cyclohexyltrichlorosilane	HCl
1765	156	Dichloroacetyl chloride	HCl

Chemical Symbols for TIH 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		

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

ID No.	Guide No.	Name of Material	TIH Gas(es) Produced
1766	156	Dichlorophenyltrichlorosilane	HCl
1767	155	Diethylchlorosilane	HCl
1769	156	Diphenyldichlorosilane	HCl
1771	156	Dodecyltrichlorosilane	HCl
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

Chemical Symbols for TIH 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		

Table 2

Important:

- Some Water Reactive materials are also TIH materials themselves (e.g., Bromine trifluoride (ID No. 1746)). In these instances, two entries are provided in **Table 1**:
 - One for *when spilled on land* and,
 - The other for *when spilled in water*.
- 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.



Table 3

TABLE 3 – Initial Isolation and Protective Action Distances for Different Quantities of Six Common TIH Gases contains:

- A list of commonly encountered Toxic Inhalation Hazard materials
- The materials are:
 - Ammonia, anhydrous (UN1005)
 - Chlorine (UN1017)
 - Ethylene oxide (UN1040)
 - Hydrogen chloride, anhydrous (UN1050) and Hydrogen chloride, refrigerated liquid (UN2186)
 - Hydrogen fluoride, anhydrous (UN1052)
 - Sulfur dioxide / Sulphur dioxide (UN1079)



TABLE 3 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES FOR DIFFERENT QUANTITIES OF SIX COMMON TIH GASES

TRANSPORT CONTAINER	UN 1005 Ammonia, anhydrous: Large Spills													
	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)	
Rail tank car	300	(1000)	2.3	(1.4)	1.3	(0.8)	1.0	(0.6)	6.3	(3.9)	2.6	(1.6)	1.3	(0.8)
Highway tank truck or trailer	125	(400)	1.0	(0.6)	0.5	(0.3)	0.3	(0.2)	2.6	(1.6)	0.8	(0.5)	0.5	(0.3)
Agricultural nurse tank	60	(200)	0.6	(0.4)	0.3	(0.2)	0.3	(0.2)	1.5	(0.9)	0.5	(0.3)	0.3	(0.2)
Multiple small cylinders	30	(100)	0.3	(0.2)	0.1	(0.1)	0.1	(0.1)	0.8	(0.5)	0.3	(0.2)	0.1	(0.1)
TRANSPORT CONTAINER	UN 1017 Chlorine: Large Spills													
Rail tank car	1000	(3000)	11+	(7+)	9.0	(5.6)	5.5	(3.4)	11+	(7+)	11+	(7+)	7.1	(4.4)
Highway tank truck or trailer	1000	(3000)	6.0	(6.6)	3.5	(2.2)	2.9	(1.8)	11+	(7+)	5.5	(3.4)	4.2	(2.6)
Multiple ton cylinders	400	(1250)	4.0	(2.5)	1.5	(0.9)	1.1	(0.7)	7.9	(4.9)	2.7	(1.7)	1.5	(0.9)
Multiple small cylinders or single ton cylinder	250	(800)	2.6	(1.6)	1.0	(0.6)	0.8	(0.5)	5.6	(3.5)	1.8	(1.1)	0.8	(0.5)

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

BLEVE

Definition : Boiling Liquid Expanding Vapour Explosion

- A BLEVE happens if a container holding a **pressurized liquefied gas** fails catastrophically. Catastrophic failure of the vessel is followed by the explosive release of boiling liquid and expanding vapour.

NOTE: A BLEVE can occur even if the material is non-flammable.



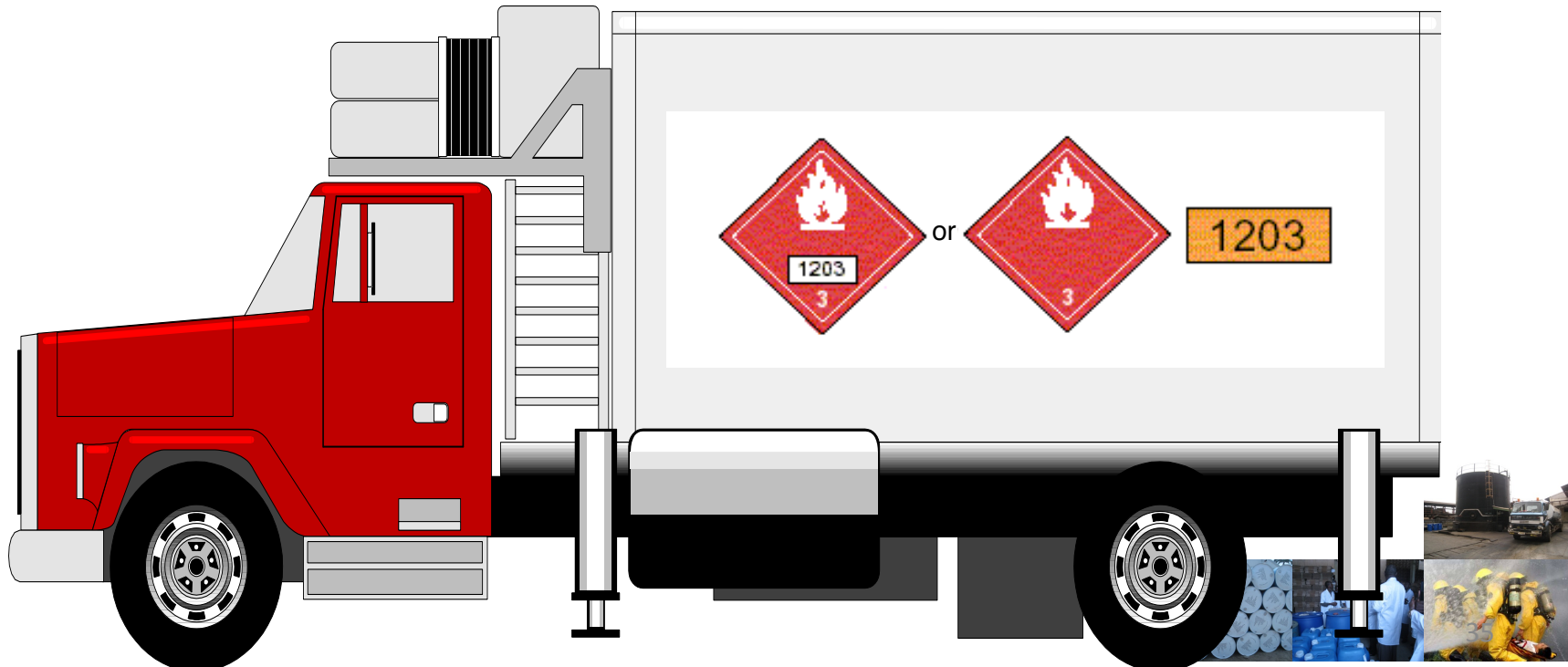
BLEVE

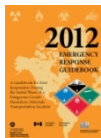
- When confronted with a possible BLEVE involving liquefied petroleum gases (LPG), important safety-related information can be found on page 367 of the ERG2012:
 - LPGs (UN1075) include the following flammable gases:
 - Butane, UN1011
 - Propylene, UN1077
 - Butylene, UN1012
 - Isobutane, UN1969
 - Isobutylene, UN1055
 - Propane, UN1978
- The main hazards from a LPG BLEVE are:
 - fire
 - thermal radiation from the fire
 - blast
 - projectiles



How to use the ERG2012


- 1) Identify the material by finding any one of the following information:
 - A. The 4-digit ID Number on a placard or orange panel;



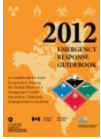


How to use the ERG2012

B. The 4-digit ID Number (following UN or NA) on a shipping document or package;

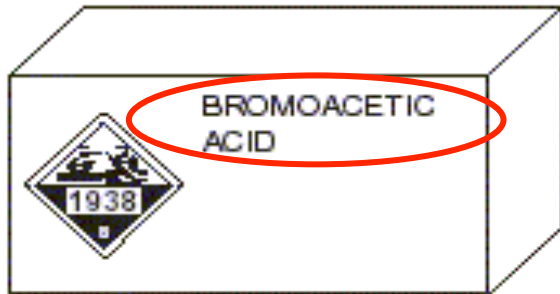
SHIPPING DOCUMENT						
Destination(City-Town) Name: <i>Company ABC</i> Address: <i>1234 Main st.</i> <i>Town, Province</i>			Consignor Name: <i>Company DEF</i> Address: <i>5678 1st Avenue</i> <i>Town, Province</i>			
Name of carrier <i>Transport ABC</i>	Prepaid <input checked="" type="checkbox"/>	Collect <input type="checkbox"/>	Transport unit no. <i>1</i>			
Point of origin			Shipping date <i>05/01/2005</i>	Shipper's no. <i>1234</i>		
REGULATED DANGEROUS GOODS			24 HOUR NUMBER: <i>613-996-6666</i> ERP reference & telephone number: <i>N/A</i>			
Shipping name (technical name) if applicable	class primary	class subsidiary	UN number	packing group/risk group	quantity	packages requiring labels
<i>Gasoline</i>	<i>3</i>	<i>-</i>	<i>1203</i>	<i>II</i>	<i>6000L</i>	<i>—</i>
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE TRANSPORTATION OF DANGEROUS GOODS REGULATIONS						
SPECIAL INSTRUCTIONS						
NON REGULATED GOODS						
Packages	Description of articles					Weight
Received in apparent good order					Consignee's signature	
						
Received above in apparent good order			Driver's signature		Drivers' no.	

Example of a shipping document

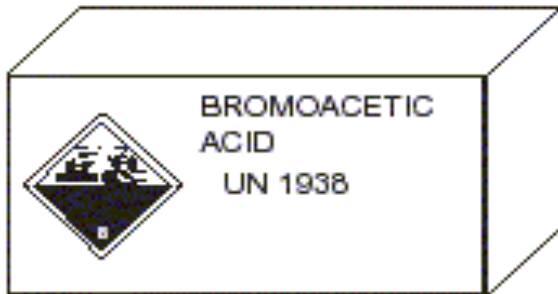


How to use the ERG2012

C. The name of the material on a shipping document or package.



OR



Example of a package

SHIPPING DOCUMENT								
Destination(City-Town) Name: <i>Company ABC</i> Address: <i>1234 Main st.</i> <i>Town, Province</i>				Consignor Name: <i>Company DEF</i> Address: <i>5678 1st Avenue</i> <i>Town, Province</i>				
Name of carrier <i>Transport ABC</i>		Prepaid <input checked="" type="checkbox"/> Collect <input type="checkbox"/>		Transport unit no. <i>1</i>				
Point of origin				Shipping date <i>05/01/2005</i>		Shipper's no. <i>1234</i>		
REGULATED DANGEROUS GOODS				24 HOUR NUMBER : <i>613-996-6666</i> ERP reference & telephone number : <i>N/A</i>				
Shipping name (technical name) if applicable			class primary	class subsi- diary	UN number	packing group/ risk group	quantity	packages requiring labels
<i>Gasoline</i>			<i>3</i>	<i>-</i>	<i>1203</i>	<i>II</i>	<i>6000L</i>	<i>—</i>
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE TRANSPORTATION OF DANGEROUS GOODS REGULATIONS								
SPECIAL INSTRUCTIONS								
NON REGULATED GOODS								
Packages	Description of articles						Weight	
Received in apparent good order						Consignee's signature		Shipper's signature
Received above in apparent good order						Driver's signature		Drivers' no.

Example of a shipping document

How to use the ERG2012

- 2) Look up the material's 3-digit Guide number in either:
- The ID Number index (**YELLOW**-bordered pages);
 - The name of material index (**BLUE**-bordered pages);
 - As a ***last resort***, if the ID number or the name of material are not available, use the Table of Placards and/or the Rail Car and Road Trailer Identification Charts.

Note if the substance is highlighted in **GREEN**;



How to use the ERG2012

- 3) Turn to the numbered guide (**ORANGE**-bordered pages):
- Read carefully all the information provided in the **ORANGE** Guide and use the **GREEN** Section if the substance is highlighted.

It is important to verify if the substance found in the **YELLOW** or **BLUE**-bordered pages is highlighted in **GREEN**, in order to use the relevant distances from the **ORANGE** and/or **GREEN** Sections.

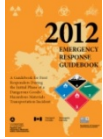


How to use the ERG2012

Caution:

- If a reference to a guide cannot be found and the incident is believed to involve dangerous goods:
 - Turn to **GUIDE 111** and use it until additional information becomes available.
- If the incident involves explosives:
 - Use **GUIDE 112** for all explosives, except:
 - For Class 1.4 and 1.6 explosives, use **GUIDE 114**.





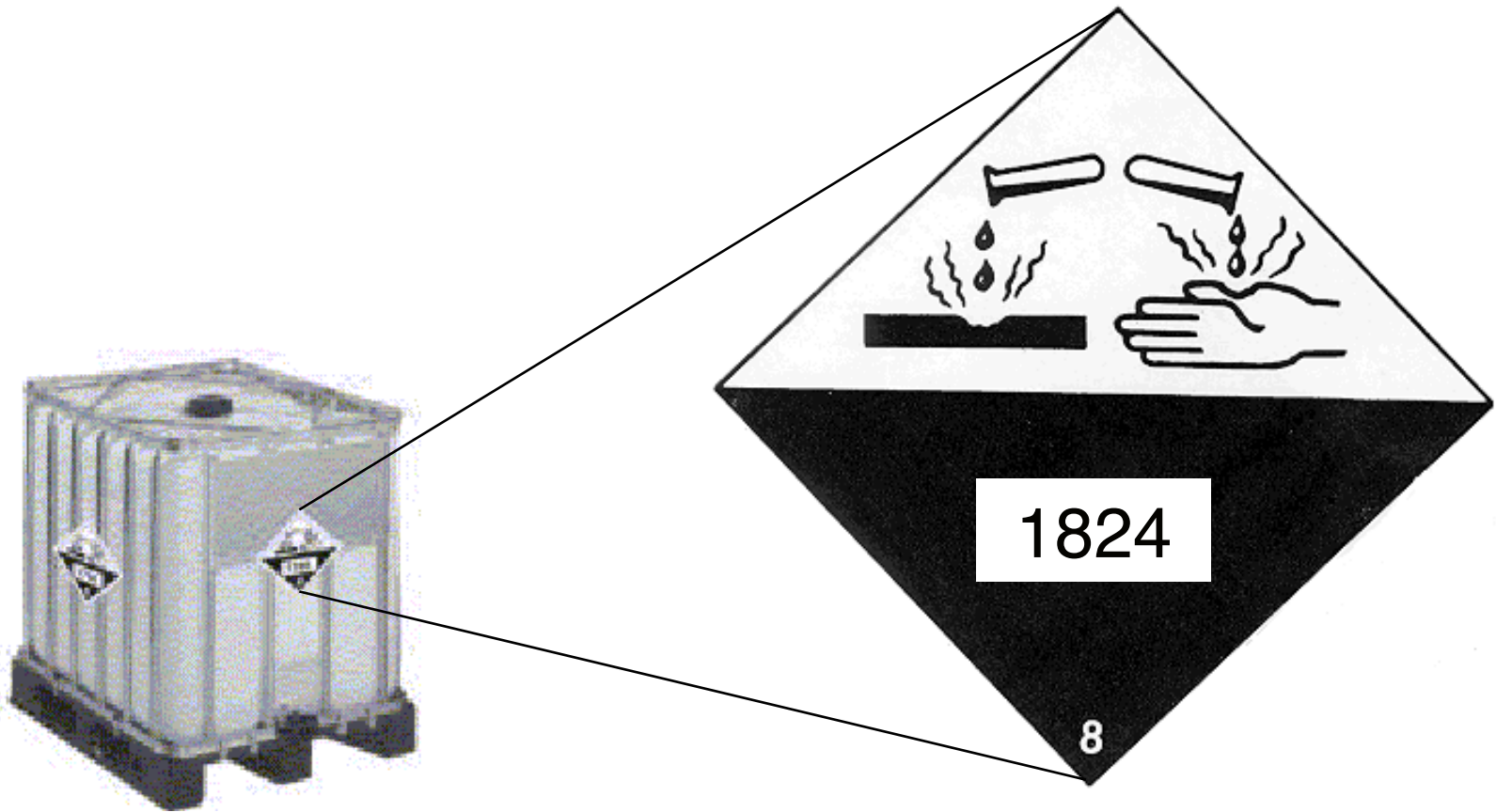
How to use the ERG2012

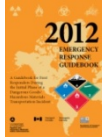
For each of the following examples:

- Find the appropriate guide in the **ORANGE**-bordered section;
- Identify the suggested distances / zones in the **ORANGE** and/or **GREEN** Sections;
- Describe the main characteristics and hazards of the substance.

Example 1

- A 1000-litre tote container is leaking.





Solution for Example 1



- ID No. is 1824;
- The **YELLOW**-bordered pages indicate that the name of the material is *sodium hydroxide, solution* or *caustic soda, solution* and refers to **Guide 154**;
- The **Guide 154** corresponds to ***Substances - Toxic and/or Corrosive (Non-Combustible)***;
- The substance is not highlighted; therefore the **GREEN** section does not apply;
- As an immediate precautionary measure, isolate the spill or leak area in all directions for at least 50 metres for liquids;



1814	154	Caustic potash, liquid	1830	137	Sulfuric acid
1814	154	Caustic potash, solution	1830	137	Sulfuric acid, with more than 51% acid
1814	154	Potassium hydroxide, solution	1830	137	Sulphuric acid
1815	132	Propionyl chloride	1830	137	Sulphuric acid, with more than 51% acid
1816	155	Propyltrichlorosilane	1831	137	Sulfuric acid, fuming
1817	137	Pyrosulfuryl chloride	1831	137	Sulfuric acid, fuming, with less than 30% free Sulfur trioxide
1817	137	Pyrosulphuryl chloride	1831	137	Sulfuric acid, fuming, with not less than 30% free Sulfur trioxide
1818	157	Silicon tetrachloride	1831	137	Sulphuric acid, fuming
1819	154	Sodium aluminate, solution	1831	137	Sulphuric acid, fuming, with less than 30% free Sulphur trioxide
1823	154	Caustic soda, bead	1831	137	Sulphuric acid, fuming, with not less than 30% free Sulphur trioxide
1823	154	Caustic soda, flake	1832	137	Sulfuric acid, spent
1823	154	Caustic soda, granular	1832	137	Sulphuric acid, spent
1823	154	Caustic soda, solid	1833	154	Sulfurous acid
1823	154	Sodium hydroxide, bead	1833	154	Sulphurous acid
1823	154	Sodium hydroxide, dry	1834	137	Sulfuryl chloride
1823	154	Sodium hydroxide, flake	1834	137	Sulphuryl chloride
1823	154	Sodium hydroxide, granular			
1823	154	Sodium hydroxide, solid			
1824	154	Caustic soda, solution			
1824	154	Sodium hydroxide, solution			
1825	157	Sodium monoxide			





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 oxidizers and may ignite combustibles (wood, paper, oil, clothing, etc.).
- Contact with metals may evolve flammable hydrogen gas.
- Containers may explode when heated.
- For UN3171, if Lithium ion batteries are involved, also consult GUIDE 147.

PUBLIC SAFETY

- **CALL EMERGENCY RESPONSE Telephone Number on Shipping Paper first. If Shipping Paper 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 in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind.
- Keep out of low areas.
- 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

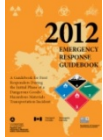
Spill

- 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".

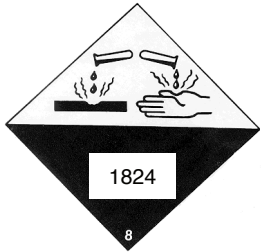
Fire

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

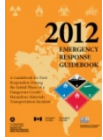




Solution for Example 1



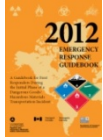
- In **Guide 154**, under the ***Potential Hazards*** section, the ***Health*** hazards precede the ***Fire or Explosion*** hazards;
- This type of substance is toxic by inhalation / ingestion / skin contact;
- Effects of contact or inhalation may be delayed;
- Fire may produce irritating, corrosive and/or toxic gases;
- This type of substance is non-combustible.



Example 2

- A tanker truck carrying the following product rolled over and is leaking from the top hatch.

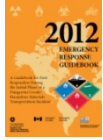




Solution for Example 2



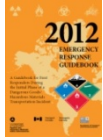
- The ID No. is 1202 and it is a flammable liquid (Class 3, red placard);
- The **YELLOW**-bordered pages indicate that the substance is *diesel fuel* or *fuel oil* and refers to **Guide 128**;
- The **Guide 128** corresponds to ***Flammable Liquids (Non-Polar / Water-Immiscible)***;
- The substance is not highlighted; therefore the **GREEN** section does not apply;
- As an immediate precautionary measure, isolate spill or leak area for at least 50 metres in all directions. If it is a large spill, consider an initial downwind evacuation for at least 300 metres;



Solution for Example 2



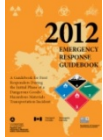
- In **Guide 128**, under the ***Potential Hazards*** section, the ***Fire or Explosion*** hazards precede the ***Health*** hazards;
- This type of substance is flammable and vapours may form explosive mixture with air;
- Most vapours are heavier than air, they will spread along the ground and collect in low or confined areas;
- Containers may explode when heated;
- Inhalation or contact with material may irritate or burn skin and eyes.



Example 3

- A truck displaying this placard is on fire on the side of the road.

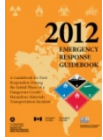




Solution for Example 3



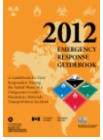
- The placard indicates the material is an explosive of class 1.4G;
- The table of placards as well as the **BLUE**-bordered pages (under *Explosives, division 1.4 or 1.6*) indicate to refer to **Guide 114**;
- The **Guide 114** corresponds to ***Explosives - Division 1.4 or 1.6***;
- In the **BLUE**-bordered pages, explosives are not highlighted substances, therefore the **GREEN** section does not apply.



Solution for Example 3

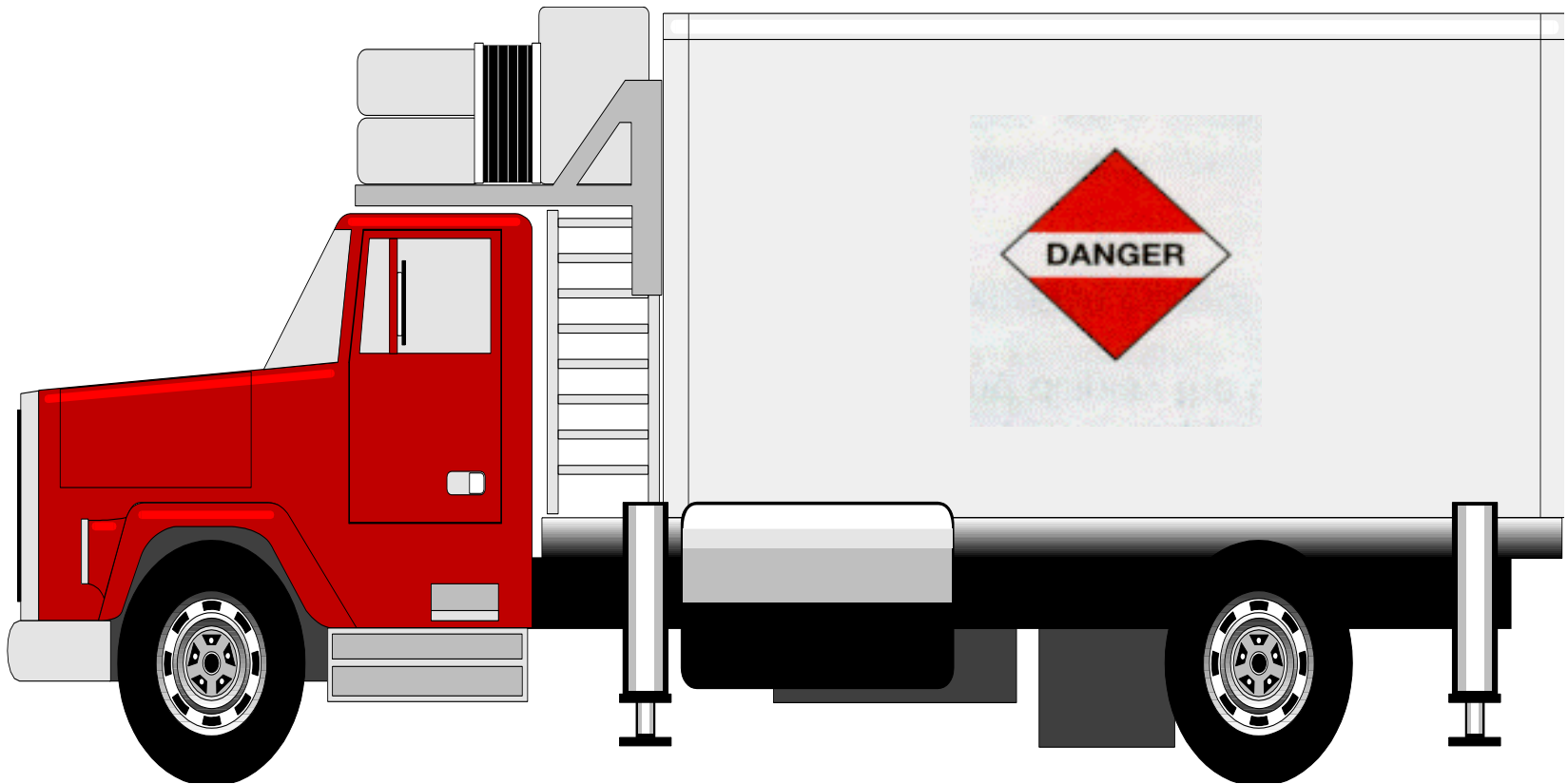


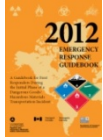
- If a truck is involved in a fire, isolate for 500 metres in all directions and initiate an evacuation, including emergency responders, for 500 metres in all directions;
- In **Guide 114**, under the **Potential Hazards** section, the **Fire or Explosion** hazards precede the **Health** hazards;
- This type of substance may explode and throw fragments at a distance of 500 metres or more if fire reaches cargo;
- Fire may produce irritating, corrosive and/or toxic gases.



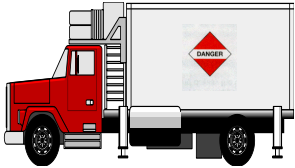
Example 4

- A truck with a DANGER placard

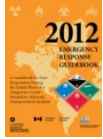




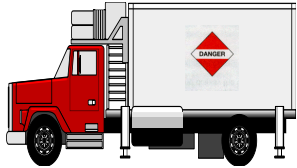
Solution for Example 4



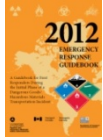
- There is no ID No. and the DANGER placard indicates a mixed load of dangerous goods;
- The table of placards indicates to refer to **Guide 111, *Mixed Load / Unidentified Cargo***;
- As an immediate precautionary measure, isolate the area for at least 100 metres in all directions until the contents of the vehicle is known;
- In case of fire, isolate and evacuate for 800 metres in all directions.



Solution for Example 4



- In **Guide 111**, under the ***Potential Hazards*** section, the ***Fire or Explosion*** hazards precede the ***Health*** hazards;
- Until the vehicle content is known, all hazards must be considered:
 - flammability,
 - corrosivity,
 - toxicity...

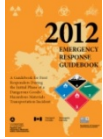


Example 5

- A rail car is leaking during the day, at a well-known facility in your area, where chlorine cars are handled.



KTVI-TV St.Louis, Missouri, USA

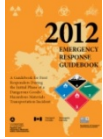


Solution for Example 5



KTVI-TV St.Louis, Missouri, USA

- The product involved is *chlorine*;
- The **BLUE**-bordered pages indicates that the ID number is 1017 and refers to **Guide 124**;
- The **Guide 124** corresponds to ***Gases – Toxic and/or Corrosive – Oxidizing***;
- In **Guide 124**, under ***Potential Hazards***, the ***Health*** hazards precede the ***Fire or Explosion*** hazards;
- The **Guide 124** indicates that this product is toxic and may be fatal if inhaled or absorbed through the skin.

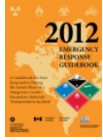


Solution for Example 5



KTVI-TV St.Louis, Missouri, USA

- The substance is highlighted in GREEN:
 - Since there is a spill, the initial isolation and protective action distances must be taken from **Table 1**;
 - For this substance (ID No. 1017), **Table 1** suggest:
 - An initial isolation distance of 500 metres for a large spill and,
 - A protective action distance of 3 km for a large spill during the day.
- In **Table 1**, the asterisk (*) to right of the ID No. 1017 indicates that **Table 3** should also be consulted.

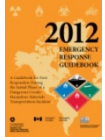


Solution for Example 5



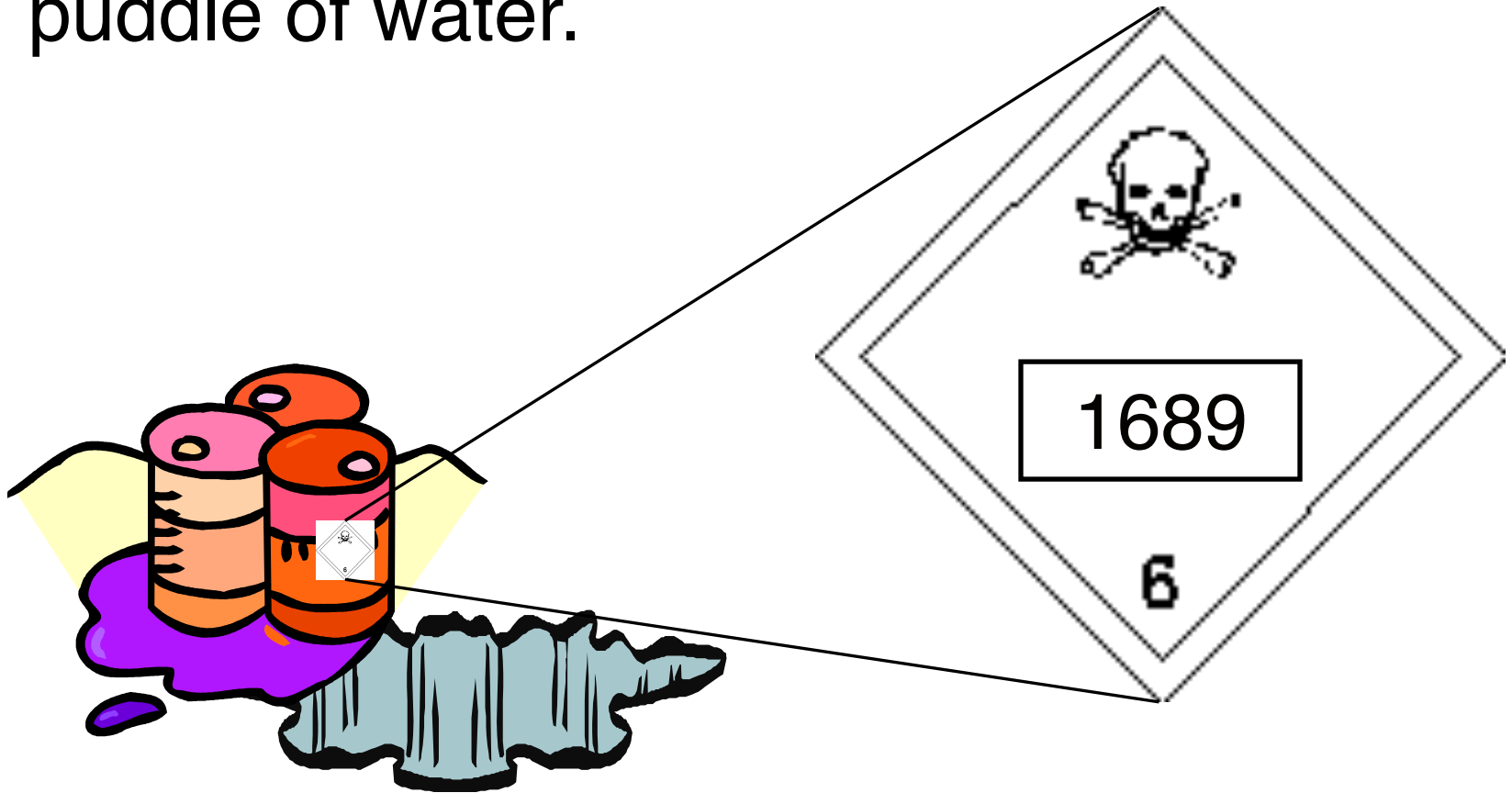
KTVI-TV St.Louis, Missouri, USA

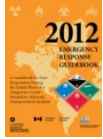
- **Table 3** provides initial isolation and protective action distances for **large spills** (more than 208 litres or 55 US gallons) involving different container types (therefore different volume capacities) for day time and night time situations and different wind speeds.
- In this case, for a rail car, the initial isolation distance suggested in **Table 3** is 1000 metres. The protective action distances must be taken during the day, depending on the wind speed (11+ km, 9 km or 5.5 km).



Example 6

- A drum is leaking in a puddle of water.

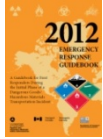




Solution for Example 6



- The ID Number is 1689;
- The **YELLOW**-bordered pages indicate that this substance is *sodium cyanide* and refers to **Guide 157**;
- The **Guide 157** corresponds to ***Substances – Toxic and/or Corrosive (Non-Combustible / Water-Sensitive)***;
- The **Guide 157** indicates that this type of substance is toxic and non-combustible, but fire will produce irritating, corrosive and/or toxic gases;

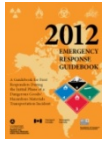


Solution for Example 6



- The substance is highlighted in GREEN:
 - Since there is a spill, the initial isolation and protective action distances must be taken from **Table 1**.

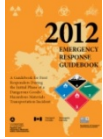
- For this substance (ID No.1689), **Table 1** suggests distances specifically **when the product is spilled in water**. If this is not the case, the initial isolation and evacuation distances must be taken from **Guide 157**, under ***Public Safety***;



Solution for Example 6



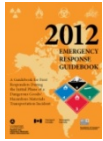
- Since the product is leaking in water, **Table 1** suggests an initial isolation distance of 30 metres in all directions for a small spill and 100 metres in all directions for a large spill;
- Additionally, the protective action distances for day and night will have to be taken from the **Table 1**;
- In **Table 1**, the description “**when spilled in water**” indicates a substance is water-reactive.



Solution for Example 6



- In this case, **Table 2** must also be consulted where the TIH gases produced are listed, for each water-reactive substance.
- For the ID No. 1689, the gas produced is *HCN* or *hydrogen cyanide*.
- When searching for *hydrogen cyanide* in the **BLUE** section, there is a reference to **Guide 117**, which correspond to ***Gases – Toxic – Flammable (Extreme Hazard)***.



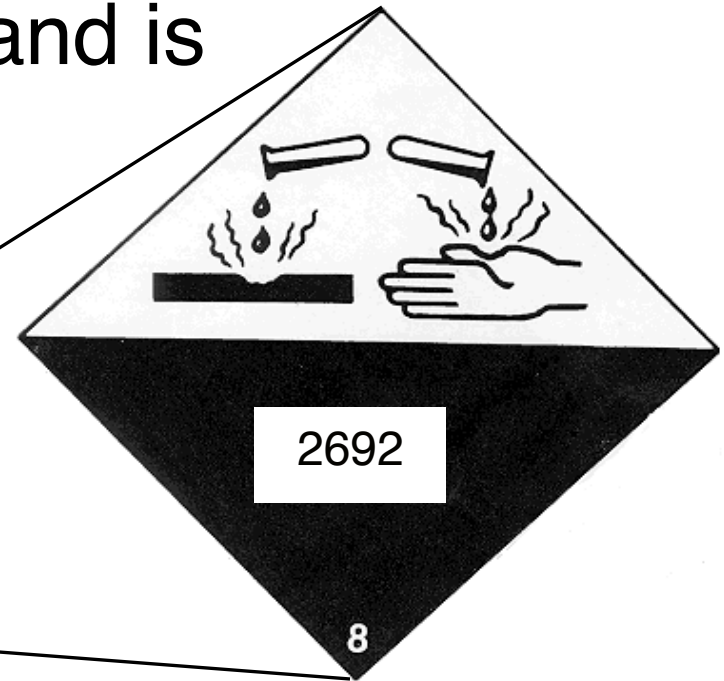
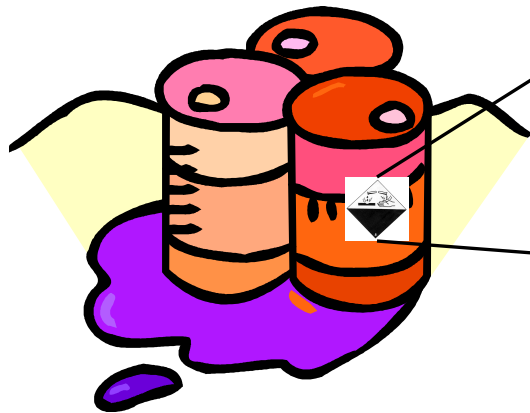
Solution for Example 6

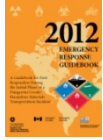


NOTE: For a water-reactive material, it is important that the initial isolation and protective action distances be taken for the material itself **when spilled in water** in **Table 1** (*in this case ID No. 1689 – sodium cyanide*) and not for the generated TIH gas (*hydrogen cyanide*) indicated in **Table 2**.

Example 7

- A drum containing this substance is punctured and is leaking on the ground.





Solution for Example 7



- The ID No. is 2692;
- The **YELLOW**-bordered pages indicate that this substance is called *boron tribromide* and refers to **Guide 157**;
- The **Guide 157** correspond to ***Substances – Toxic and/or Corrosive (Non-Combustible / Water-Sensitive)***;
- The substance is highlighted in **GREEN**:
 - Since there is spill, the initial isolation and protective action distances must be taken from **Table 1**;
 - For this product, the **Table 1** presents 2 separate entries for ID No. 2692: the 1st applies when the product is **spilled on land** and the 2nd **when it is spilled in water**;



2661	153	Hexachloroacetone
2662	153	Hydroquinone
2662	153	Hydroquinone, solid
2664	160	Dibromomethane
2667	152	Butyltoluenes
2668	131	Chloroacetonitrile
2669	152	Chlorocresols
2669	152	Chlorocresols, liquid
2669	152	Chlorocresols, solid
2669	152	Chlorocresols, solution
2670	157	Cyanuric chloride
2671	153	Aminopyridines
2672	154	Ammonia, solution, with more than 10% but not more than 35% Ammonia
2672	154	Ammonium hydroxide
2672	154	Ammonium hydroxide, with more than 10% but not more than 35% Ammonia
2673	151	2-Amino-4-chlorophenol
2674	154	Sodium fluorosilicate
2674	154	Sodium silicofluoride
2676	119	Stibine
2677	154	Rubidium hydroxide, solution
2678	154	Rubidium hydroxide
2678	154	Rubidium hydroxide, solid

2682	157	Cesium hydroxide
2683	132	Ammonium sulfide, solution
2683	132	Ammonium sulphide, solution
2684	132	3-Diethylaminopropylamine
2684	132	Diethylaminopropylamine
2685	132	N,N-Diethylethylenediamine
2686	132	2-Diethylaminoethanol
2686	132	Diethylaminoethanol
2687	133	Dicyclohexylammonium nitrite
2688	159	1-Bromo-3-chloropropane
2688	159	1-Chloro-3-bromopropane
2689	153	Glycerol alpha-monochlorohydrin
2690	152	N,n-Butylimidazole
2691	137	Phosphorus pentabromide
2692	157	Boron tribromide
2693	154	Bisulfites, aqueous solution, n.o.s.
2693	154	Bisulfites, inorganic, aqueous solution, n.o.s.
2693	154	Bisulphites, aqueous solution, n.o.s.
2693	154	Bisulphites, inorganic, aqueous solution, n.o.s.
2698	156	Tetrahydrophthalic anhydrides
2699	154	Trifluoroacetic acid
2705	153P	1-Pentol



Consequences may depend upon location of a spill/incident and other factors.

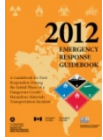
PUBLIC SAFETY

- **CALL EMERGENCY RESPONSE Telephone Number on Shipping Paper first.** If Shipping Paper 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 in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.
- Keep unauthorized personnel away.

TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

Page 314

ID No.	Guide	NAME OF MATERIAL	SMALL SPILLS <i>(From a small package or small leak from a large package)</i>				LARGE SPILLS <i>(From a large package or from many small packages)</i>			
			First ISOLATE in all Directions		Then PROTECT persons Downwind during-		First ISOLATE in all Directions		Then PROTECT persons Downwind during-	
			Meters (Feet)	Kilometers (Miles)	DAY	NIGHT	Meters (Feet)	Kilometers (Miles)	DAY	NIGHT
2691	137	Phosphorus pentabromide (when spilled in water)	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)	1.0 km (0.6 mi)		
2692	157	Boron tribromide (when spilled on land)	30 m (100 ft)	0.1 km (0.1 mi)	0.3 km (0.2 mi)	30 m (100 ft)	0.3 km (0.2 mi)	0.7 km (0.4 mi)		
2692	157	Boron tribromide (when spilled in water)	30 m (100 ft)	0.1 km (0.1 mi)	0.4 km (0.3 mi)	60 m (200 ft)	0.8 km (0.5 mi)	2.5 km (1.6 mi)		
2740	155	n-Propyl chloroformate	30 m (100 ft)	0.1 km (0.1 mi)	0.3 km (0.2 mi)	60 m (200 ft)	0.6 km (0.4 mi)	1.1 km (0.7 mi)		



Solution for Example 7



- In this case, the product is spilled on the ground and the initial isolation distance suggested in **Table 1** is 30 metres in all directions for a small or large spill;
- Additionally, the protective action distances for day and night will have to be taken from **Table 1**;
- The **Guide 157** indicates that this type of substance is toxic and non-combustible, but a fire will produce irritating, corrosive and/or toxic gases.

- QUESTIONS?

