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

EMERGENCY RESPONSE **GUIDEBOOK**





U.S. Department of Transportation Pipeline and **Hazardous Materials Safety Administration**



Transport Canada

Transports Canada





GUIDE GASES - FLAMMABLE (INCLUDING REFRIGERATED LIQUIDS)

POTENTIAL HAZARDS

FIRE OR EXPLOSION

- EXTREMELY FLAMMABLE.
- Will be easily ignited by heat, sparks or flames.
- · Will form explosive mixtures with air.
- Vapors from liquefied gas are initially heavier than air and spread along ground.
- CAUTION: Hydrogen (UN1049), Deuterium (UN1957), Hydrogen, refrigerated liquid (UN1966) and Methane (UN1971) are lighter than air and will rise. Hydrogen and Deuterium fires are difficult to detect since they burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.)
- · Vapors may travel to source of ignition and flash back.
- Cylinders exposed to fire may vent and release flammable gas through pressure relief devices.
- Containers may explode when heated.
- · Ruptured cylinders may rocket.

HEALTH

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

PUBLIC SAFETY

- CALL EMERGENCY RESPONSE Telephone Number on 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 100 meters (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).

PROTECTIVE CLOTHING

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

EVACUATION

Large Spill

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

Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.
- In fires involving Liquefied Petroleum Gases (LPG) (UN1075); Butane, (UN1011); Butylene, (UN1012); Isobutylene, (UN1055); Propylene, (UN1077); Isobutane, (UN1969); and Propane, (UN1978), also refer to BLEVE SAFETY PRECAUTIONS (Page 368)



In Canada, an Emergency Response Assistance Plan (ERAP) may be required for this product. Please consult the shipping document and/or the ERAP Program Section (page 391).

Gases - Flammable (Including Refrigerated Liquids)

EMERGENCY RESPONSE

FIRE

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

CAUTION: Hydrogen (UN1049), Deuterium (UN1957) and Hydrogen, refrigerated liquid (UN1966) burn with an invisible flame. Hydrogen and Methane mixture, compressed (UN2034) may burn with an invisible flame.

Small Fire

Dry chemical or CO₂.

Large Fire

- Water spray or fog.
- Move containers from fire area if you can do it without risk.

Fire involving Tanks

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- · Cool containers with flooding quantities of water until well after fire is out.
- · Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or 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.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.
- Prevent spreading of vapors through sewers, ventilation systems and confined areas.
- Isolate area until gas has dispersed.

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

FIRST AID

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 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.
- Clothing frozen to the skin should be thawed before being removed.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim calm and warm.

GUIDE 115

GASES - FLAMMABLE

(Including Refrigerated Liquids)

D NO.	NAME OF MATERIAL	ID NO.	NAME OF MATERIAL
1011	Butane	1954	Dispersant gases, n.o.s. (flammable)
1012	Butylene	1954	Refrigerant agses, n.o.s. (flammable)
1027	Cyclopropane	1957	Deuterium
1030	1,1 - Difluoroethane	1957	Deuterium, compressed
1030	Refrigerant gas R - 152a	1961	Ethane, refrigerated liquid
1033	Dimethylether	1961	Ethane-Propane mixture, refrigerated liquid
1035	Ethane	1951	Propane-Ethane mixture, refrigerated liquid
1035	Ethane, compressed	1964	Hydrocarbon gas mixture, compressed, n.o.s.
1037	Ethyl chloride	1965	Hydrocarbon gas mixture, liquefied, n.o.s.
	Ethylene, refrigerated liquid (cryogenic		Hydrogen, refrigerated liquid (cryogenic liquid)
1038	liquid)	1966	
1039	Ethyl methyl ether	1969	Isobutane
1039	Methyl ethyl ether	1971	Methane
	Carbon dioxide and Ethylene oxide mixture,		Methane, compressed Natural gas, compressed
	with more than 9% but not more than 87%		
1041	Ethylene oxide	1971	
	Ethylene oxide and Carbon dioxide mixture,	1971	
	with more than 9% but not more than 87%		
1041	Ethylene oxide		
1049	Hydrogen	1972	Liquefied natural gas (cryogenic liquid)
1049	Hydrogen, compressed	1972	LNG (cryogenic liquid)
1055	Isobutylene	1972	Methane, refrigerated liquid (cryogenic liquid)
	Lighter refills (cigarettes) (flammable gas)		Natural gas, refrigerated liquid (cryogenic liquid)
1057		1972	g , g and a qual (ar, a g a ma m q a ma)
1057	Lighters (cigarettes) (flammable gas)	1978	Propane
1063	Methyl chloride	2034	Hydrogen and Methane mixture, compressed
1063	Refrigerant gas R-40	2034	Methane and Hydrogen mixture, compressed
1075	Butane	2035	Refrigerant gas R-143a
1075	Butylene	2035	1,1,1-Trifluoroethane
1075	Isobutane .	2037	Gas cartridges
1075	Isobutylene	2037	Receptacles, small, containing gas
1075	Liquefied petroleum gas	2044	2,2-Dimethylpropane
1075	LPG	2453	Ethyl fluoride
1075	Petroleum gases, liquefied	2453	Refrigerant gas R-161
1075	Propane	. 2454	Methyl fluoride
1075	Propylene	2454	Refrigerant gas R-41
1077	Propylene	2517	1-Chloro-1, 1-difluoroethane
1912	Methyl chloride and Methylene chloride		
	mixture	2517	Difluorochloroethanes
	Methylene chloride and Methyl chloride		
1912	mixture	2517	Refrigerant gas R-142b
1954	Compressed gas, flammable, n.o.s.	2601	Cyclobutane

GUIDE 115

GASES - FLAMMABLE

(Including Refrigerated Liquids)

ID NO.	NAME OF MATERIAL	ID NO.	NAME OF MATERIAL
	Acetylene, Ethylene and Propylene in		
3138	mixture, refrigerated liquid containing at		2.61
	least 71.5% Ethylene with not more than	3358	Refrigerating machines, containing flammable, non-poisonous, liquefied gas
	22.5% Acetylene and not more than 6%		
	Propylene		
	Ethylene, Acetylene and Propylene in		
	mixture, refrigerated liquid containing at		
3138	least 71.5% Ethylene with not more than		Refrigerating machines, containing flammable, non-toxic
0200	22.5% Acetylene and not more than 6%	3358	liquefied gas
	Propylene		
	Propylene, Ethylene and Acetylene in	3336	
	mixture, refrigerated liquid containing at		
3138	least 71.5% Ethylene with not more than		Delegation of the Control of the Con
2130	I I		Hydrogen in a metal hydride storage system
	22.5% Acetylene and not more than 6%		
	Propylene	3468	
3150	Devices, small, hydrocarbon gas powered,		Hydrogen in a metal hydride storage system contained in
	with release device	3468	equipment
	Hydrocarbon gas refills for small devices,		Hydrogen in a metal hydride stroage system packed with
3150	with release device	3468	equipment
			Fuel cell cartridges contained in equipment, containing
3153	Perfluoro (methyl vinyl ether)	3478	liquefied flammable gas
3154	Perfluoro (ethyl vinyl ether)	3478	Fuel cell cartridges, containing liquefied flammable gas
			Fuel cell cartridges packed with equipment, containing
3161	Liquefied gas, flammable, n.o.s.	3478	liquefied flammable gas
	Engine, fuel cell, flammable gas powered	3479	Fuel cell cartridges contained in equipment, containing
3166	·		hydrogen in metal hydride
	Engines, internal combustion, flammable gas	2470	Final call control and a second secon
3166	powered	3479	Fuel cell cartridges, containing hydrogen in metal hydride
		2470	Fuel cell cartridges packed with equipment, containing
3166	Vehicle, flammable gas powered	3479	hydrogen in metal hydride
	Vehicle, fuel cell, flammable gas powered		
3166		3501	Chemical under pressure, flammable, n.o.s.
	Gas sample, non-pressurized, flammable,		
3167	n.o.s., not refrigerated liquid	3529	Engine, fuel cell, flammable gas powered
3252	Difluoromethane	3529	Engine, internal combustion flammable gas powered
3252	Refrigerant gas R-32	3529	Machinery, fuel cell, flammable gas powered
	Gas, refrigerated liquid, flammable, n.o.s.		
3312	, , , , , , , , , , , , , , , , , , , ,	3529	Machinery, internal combustion, flammable gas powered
3354	Insecticide gas, flammable, n.o.s.	9279	Hydrogen absorbed in metal hydride
	gee, weather early moist	32/3	nydrogen absorbed in metarmydnue
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