

# LIQUEFIED PETROLEUM GAS

LPG

CAUTIONARY RESPONSE INFORMATION			
Common Synonyms Bottled gas LPG Propane-butane-(propylene) Pyrofax	Gas Colorless Weak odor; may have skunk odor added  Floats and boils on water. Flammable vapor cloud is produced.		
<p>Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Evacuate area in case of large discharge. Avoid contact with liquid. Notify local health and pollution control agencies.</p>			
Fire	FLAMMABLE. Flashback along vapor trail may occur. Containers may explode in fire. May explode if ignited in an enclosed area. Stop discharge if possible. Cool exposed containers and protect men effecting shutoff with water. Let fire burn.		
<p><b>Exposure</b></p> <p>VAPOR Not irritating to eyes, nose and throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. CALL FOR MEDICAL AID.</p> <p>LIQUID Will cause frostbite. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.</p>			
Water Pollution	Not harmful to aquatic life.		

1. CORRECTIVE RESPONSE ACTIONS Stop discharge Chemical and Physical Treatment: Burn	2. CHEMICAL DESIGNATIONS 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>3</sub> H <sub>8</sub> -C <sub>4</sub> H <sub>10</sub> (mixture) 2.3 IMO/UN Designation: 2.0/1075 2.4 DOT ID No.: 1075 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: 115 2.7 Standard Industrial Trade Classification: 34000	3. HEALTH HAZARDS 3.1 Personal Protective Equipment: Self-contained breathing apparatus for high concentrations of gas. 3.2 Symptoms Following Exposure: Concentrations in air greater than 10%; cause dizziness in a few minutes, 1% concentrations give the same symptom in 10 min. High concentrations cause asphyxiation. 3.3 Treatment of Exposure: Remove victim to open air. If he is overcome by gas, apply artificial resuscitation. Guard against self-injury if confused. 3.4 TLV-TWA: 1,000 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Not pertinent 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: None 3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat. 3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly. May cause frostbite. 3.12 Odor Threshold: 5000-20,000 ppm 3.13 IDLH Value: 2,000 ppm 3.14 OSHA PEL-TWA: 1,000 ppm 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	4. FIRE HAZARDS 4.1 Flash Point: Propane: -156°F/C.; butane: -76°F/C. 4.2 Flammable Limits in Air: Propane: 2.2%-9.5%; butane: 1.8%-8.4%. 4.3 Fire Extinguishing Agents: Allow to burn while cooling adjacent equipment with water spray. Extinguish small fires with dry chemicals. Shut off leak if possible. 4.4 Fire Extinguishing Agents Not to Be Used: Water (let fire burn) 4.5 Special Hazards of Combustion Products: Not pertinent 4.6 Behavior in Fire: Containers may explode in fire. Vapor heavier than air and may travel a long distance to a source of ignition and flash back. 4.7 Auto Ignition Temperature: Propane: 871°F; butane: 761°F 4.8 Electrical Hazards: Class I, Group D 4.9 Burning Rate: 8.2 mm/min. 4.10 Adiabatic Flame Temperature: 2419. (Est.) 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent. 4.12 Flame Temperature: Currently not available 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent. 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed	7. SHIPPING INFORMATION 7.1 Grades of Purity: Various grades, mostly propane. In some areas propylene may be included. The proportion may be varied with the season. 7.2 Storage Temperature: Ambient 7.3 Inert Atmosphere: No requirement 7.4 Venting: Safety relief 7.5 IMO Pollution Category: Currently not available 7.6 Ship Type: Currently not available 7.7 Barge Hull Type: Currently not available	8. HAZARD CLASSIFICATIONS 8.1 49 CFR Category: Flammable gas 8.2 49 CFR Class: 2.1 8.3 49 CFR Package Group: Not pertinent. 8.4 Marine Pollutant: No 8.5 NFPA Hazard Classification: <table border="0"> <tr> <th style="text-align: center;">Category</th> <th style="text-align: center;">Classification</th> </tr> <tr> <td style="text-align: center;">Health Hazard (Blue)</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">Flammability (Red)</td> <td style="text-align: center;">4</td> </tr> <tr> <td style="text-align: center;">Instability (Yellow)</td> <td style="text-align: center;">0</td> </tr> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	4	Instability (Yellow)	0	9. PHYSICAL & CHEMICAL PROPERTIES 9.1 Physical State at 15° C and 1 atm: Gas 9.2 Molecular Weight: >44 9.3 Boiling Point at 1 atm: > -40°F = > -40°C = > 233°K 9.4 Freezing Point: Not pertinent 9.5 Critical Temperature: -142.01°F = -96.67°C = 176.53°K 9.6 Critical Pressure: 616.5 psia = 41.94 atm = 4,249 MN/m <sup>2</sup> 9.7 Specific Gravity: 0.51 0.58 at -50°C (liquid) 9.8 Liquid Surface Tension: 16 dynes/cm = 0.016 N/m at -47°C 9.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at -38°C 9.10 Vapor (Gas) Specific Gravity: 1.5 9.11 Ratio of Specific Heats of Vapor (Gas): 1.130 9.12 Latent Heat of Vaporization: 183.2 Btu/lb = 101.8 cal/g = 4.262 X 10 <sup>3</sup> J/kg 9.13 Heat of Combustion: -19.782 Btu/lb = -10,990 cal/g = 460.13 X 10 <sup>3</sup> J/kg 9.14 Heat of Decomposition: Not pertinent 9.15 Heat of Solution: Not pertinent 9.16 Heat of Polymerization: Not pertinent 9.17 Heat of Fusion: Currently not available 9.18 Limiting Value: Currently not available 9.19 Reid Vapor Pressure: High "Physical properties apply to propane. No "standard" LPG exists."	NOTES	
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Health Hazard (Blue)	1															
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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-180	36.490	-50	0.546		N	-145	0.433
-175	36.300	-40	0.560		T	-140	0.413
-170	36.110	-30	0.574		R	-135	0.395
-165	35.920	-20	0.588		I	-130	0.378
-160	35.730	-10	0.602		N	-125	0.362
-155	35.540	0	0.615		E	-120	0.347
-150	35.340	10	0.629		T	-115	0.333
-145	35.150	20	0.643		R	-110	0.321
-140	34.960	30	0.657		I	-105	0.309
-135	34.770	40	0.671		N	-100	0.297
-130	34.580	50	0.685		E	-95	0.287
-125	34.390	60	0.699		T	-90	0.277
-120	34.200	70	0.713			-85	0.268
-115	34.010	80	0.727			-80	0.259
-110	33.820	90	0.740			-75	0.251
-105	33.630	100	0.754			-70	0.243
-100	33.440	110	0.768			-65	0.236
-95	33.250	120	0.782			-60	0.229
-90	33.060					-55	0.222
-85	32.870					-50	0.216
-80	32.670					-45	0.210
-75	32.480					-40	0.204
-70	32.290						
-65	32.100						
-60	31.910						
-55	31.720						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I		-230	0.002	-230	0.00003	0	0.350
N		-220	0.004	-220	0.00007	25	0.366
S		-210	0.009	-210	0.00015	50	0.382
O		-200	0.019	-200	0.00031	75	0.398
L		-190	0.039	-190	0.00060	100	0.414
U		-180	0.074	-180	0.00109	125	0.430
B		-170	0.134	-170	0.00189	150	0.445
L		-160	0.230	-160	0.00315	175	0.460
E		-150	0.380	-150	0.00503	200	0.475
		-140	0.605	-140	0.00775	225	0.490
		-130	0.931	-130	0.01158	250	0.505
		-120	1.393	-120	0.01681	275	0.520
		-110	2.029	-110	0.02379	300	0.534
		-100	2.886	-100	0.03289	325	0.549
		-90	4.017	-90	0.04454	350	0.563
		-80	5.480	-80	0.05917	375	0.577
		-70	7.344	-70	0.07725	400	0.591
		-60	9.680	-60	0.09927	425	0.605
		-50	12.570	-50	0.12570	450	0.618
		-40	16.090	-40	0.15710	475	0.632
		-30	20.340	-30	0.19400	500	0.645
		-20	25.400	-20	0.23680	525	0.658
						550	0.671
						575	0.684
						600	0.696