LIQUEFIED NATURAL GAS

LNG

CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Gas	Colorless	Odorless or weak skunk odor
LNG			

Floats and boils on water. Flammable visible vapor cloud is produced.

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.

Fire	FLAMMABLE. Flashback along vapor trail may occur. May explode if ignited in an enclosed area. Stop discharge if possible. Cool exposed area and men effecting shutoff with water. Let fire burn.
Exposure	CALL FOR MEDICAL AID. VAPOR Not irritating to eyes, nose or throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.
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: 31; Paraffin
2.2 Formula: $CH_4+C_2H_6$
2.3 IMO/UN Designation: 2.0/1058
2.4 DOT ID No.: 1972
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; protective clothing if exposed to liquid.
3.2 Symptoms Following Exposure: If concentration of gas is high enough, may cause asphyxiation. No detectable systemic effects, even at 5% concentration in air.
3.3 Treatment of Exposure: Remove victim to open air. If he is overcome by gas, apply artificial resuscitation.
3.4 TLV-TWA: Currently not available
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 some frostbite.
3.12 Odor Threshold: Currently not available
3.13 IDLH Value: Not listed.
3.14 OSHA PEL-TWA: Not listed.
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: Flammable gas
4.2 Flammable Limits in Air: 5.3%-14.0%
4.3 Fire Extinguishing Agents: Do not extinguish large spill fires. Allow to burn while cooling adjacent equipment with water spray. Shut off leak if possible. Extinguish small fires with dry chemicals.
4.4 Fire Extinguishing Agents Not to Be Used: Water
4.5 Special Hazards of Combustion Products: Not pertinent
4.6 Behavior in Fire: Not pertinent
4.7 Auto Ignition Temperature: 999°F
4.8 Electrical Hazards: Class I, Group D
4.9 Burning Rate: 12.5 mm/min.
4.10 Adiabatic Flame Temperature: 2339. (Est.)
4.11 Stoichometric 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

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction
5.2 Reactivity with Common Materials: No reaction
5.3 Stability During Transport: Stable
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
5.5 Polymerization: Not pertinent
5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

6.1 Aquatic Toxicity: None
6.2 Waterfowl Toxicity: None
6.3 Biological Oxygen Demand (BOD): None
6.4 Food Chain Concentration Potential: None
6.5 GESAMP Hazard Profile: Not listed

7. SHIPPING INFORMATION

7.1 Grades of Purity: Varies with the point of origin. Usually contains at least 90% methane, with smaller quantities of ethane, propane, butanes and pentanes, carbon dioxide and nitrogen.
7.2 Storage Temperature: –260°F (–162°C)
7.3 Inert Atmosphere: No requirement
7.4 Venting: Safety relief
7.5 IMO Pollution Category: Currently not available
7.6 Ship Type: 2
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:

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: Not listed.
8.7 EPA Pollution Category: Not listed.
8.8 RCRA Waste Number: Not listed
8.9 EPA FWPCA List: Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Gas
9.2 Molecular Weight: >16
9.3 Boiling Point at 1 atm: –258°F = –161°C = 112°K
9.4 Freezing Point: –296°F = –182.2°C = 91.0°K
9.5 Critical Temperature: –116°F = –82.2°C = 191.0°K
9.6 Critical Pressure: 673 psia = 45.78 atm = 4.64 MN/m
9.7 Specific Gravity: (liquid) 0.415-0.45 at –162°C
9.8 Liquid Surface Tension: 14 dynes/cm = 0.014 N/m at -161°C
9.9 Liquid Water Interfacial Tension: Currently not available
9.10 Vapor (Gas) Specific Gravity: 0.55 - 1.0
9.11 Ratio of Specific Heats of Vapor (Gas): 1.306
9.12 Latent Heat of Vaporization: (est.) 220 Btu/lb = 120 cal/g = 5.1 X 10^5 J/kg
9.13 Heat of Combustion: –21,600 to –23,400 Btu/lb = –12,000 to –13,000 cal/g = –502.4 to –544.3 X 10^5 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 methane; no ``standard'' LNG exists.

NOTES

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LNG

9.20 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
-290	27.370
-288	27.270
-286	27.170
-284	27.080
-282	26.980
-280	26.880
-278	26.790
-276	26.690
-274	26.590
-272	26.490
-270	26.400
-268	26.300
-266	26.200
-264	26.110
-262	26.010
-260	25.910
-258	25.820

9.21 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
-290	0.802
-285	0.808
-280	0.815
-275	0.821
-270	0.827
-265	0.833
-260	0.839

9.22 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit inch per hour-square foot-F
	NOT PERTINENT

9.23 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
-290	0.290
-285	0.254
-280	0.225
-275	0.200
-270	0.179
-265	0.161
-260	0.146

9.24 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
	INSOLUBLE

9.25 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
-290	2.640
-288	3.006
-286	3.412
-284	3.861
-282	4.355
-280	4.898
-278	5.494
-276	6.146
-274	6.858
-272	7.633
-270	8.474
-268	9.387
-266	10.370
-264	11.440
-262	12.590
-260	13.820
-258	15.150
-256	16.570
-254	18.100
-252	19.720
-250	21.460
-248	23.310
-246	25.270
-244	27.360
-242	29.580
-240	31.920

9.26 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
-290	0.02464
-288	0.02773
-286	0.03111
-284	0.03480
-282	0.03882
-280	0.04318
-278	0.04790
-276	0.05300
-274	0.05849
-272	0.06441
-270	0.07076
-268	0.07756
-266	0.08483
-264	0.09259
-262	0.10090
-260	0.10970
-258	0.11900
-256	0.12890
-254	0.13930
-252	0.15040
-250	0.16210
-248	0.17440
-246	0.18730
-244	0.20090
-242	0.21520
-240	0.23010

9.27 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	0.475
25	0.484
50	0.493
75	0.502
100	0.511
125	0.520
150	0.530
175	0.539
200	0.549
225	0.559
250	0.570
275	0.580
300	0.591
325	0.602
350	0.613
375	0.624
400	0.636
425	0.647
450	0.659
475	0.671
500	0.684
525	0.696
550	0.709
575	0.721
600	0.735