NITRIC ACID

NAC

CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Watery liquid Colorless to light brown Choking odor Sinks and mixes with water. Harmful vapor is produced.

Evacuate.
Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR.
Avoid inhalation.
Wear chemical protective suit with self-contained breathing apparatus.
Notify local health and pollution control agencies.
Protect water intakes.

Fire	Not flammable. May cause fire on contact with combustibles. Flammable gas may be formed on contact with metals. Poisonous gases are produced when heated. Wear chemical protective suit with self-contained breathing apparatus. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID. VAPOR Will burn eyes, nose and throat. If inhaled, will cause 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 burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse
Stop discharge
Chemical and Physical Treatment:
Neutralize

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 3; Nitric acid
2.2 Formula: HNO_3-H_2O
2.3 IMO/UN Designation: 8.0/2031
2.4 DOT ID No.: 2031
2.5 CAS Registry No.: 7697-37-2
2.6 NAERG Guide No.: 157
2.7 Standard Industrial Trade Classification: 52233

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Air mask; rubber acid suit, hood, boots and gloves; chemical goggles; safety shower and eye bath.
3.2 Symptoms Following Exposure: Vapors irritate eyes and respiratory tract; lung injury may not become apparent for several hours following exposure. Liquid may cause severe burns to eyes and skin.
3.3 Treatment of Exposure: INHALATION: remove to fresh air, administer artificial respiration if required. INGESTION: drink large volumes of water; do NOT induce vomiting. SKIN OR EYES: flush with water for at least 15 min.
3.4 TLV-TWA: 2 ppm
3.5 TLV-STEL: Not listed.
3.6 TLV-Ceiling: 4 ppm
3.7 Toxicity by Ingestion: Grade 3; LD_{50} = 50 to 500 mg/kg
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: None
3.10 Vapor (Gas) Irritant Characteristics: 58-68%; Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 95%: Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second and third-degree burns on short contact and is very injurious to the eyes.
3.12 Odor Threshold: Currently not available
3.13 IDLH Value: 25 ppm
3.14 OSHA PEL-TWA: 2 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: Not flammable
4.2 Flammable Limits in Air: Not flammable
4.3 Fire Extinguishing Agents: Use water on adjacent fires.
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
4.5 Special Hazards of Combustion Products: May give off poisonous oxides of nitrogen and acid fumes when heated in fires.
4.6 Behavior in Fire: Decomposes and gives off poisonous oxides of nitrogen.
4.7 Auto Ignition Temperature: Not flammable
4.8 Electrical Hazards: Not pertinent
4.9 Burning Rate: Not pertinent
4.10 Adiabatic Flame Temperature: Currently not available
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: May heat up on mixing, but explosion or formation of steam unlikely.
5.2 Reactivity with Common Materials: Very corrosive to wood, paper, cloth and most metals. Toxic red oxides of nitrogen are formed.
5.3 Stability During Transport: When heated may give off toxic red oxides of nitrogen.
5.4 Neutralizing Agents for Acids and Caustics: Flush with water
5.5 Polymerization: Not pertinent
5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

6.1 Aquatic Toxicity: 72 ppm/96 hr/mosquito fish/TL_m/fresh water
330-1000 ppm/48 hr/cockle/LC_{50}/salt water
6.2 Waterfowl Toxicity: Currently not available
6.3 Biological Oxygen Demand (BOD): None
6.4 Food Chain Concentration Potential: None
6.5 GESAMP Hazard Profile:
Bioaccumulation: 0
Damage to living resources: 2
Human Oral hazard: 2
Human Contact hazard: II
Reduction of amenities: X

7. SHIPPING INFORMATION

7.1 Grades of Purity: Various grades: 52-98%
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: No requirement
7.4 Venting: Open or pressure-vacuum
7.5 IMO Pollution Category: C
7.6 Ship Type: 2
7.7 Barge Hull Type: Currently not available

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Corrosive material
8.2 49 CFR Class: 8
8.3 49 CFR Package Group: I
8.4 Marine Pollutant: No
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0
Special (White).....	OX

8.6 EPA Reportable Quantity: 1000 pounds
8.7 EPA Pollution Category: C
8.8 RCRA Waste Number: Not listed
8.9 EPA FWPCA List: Yes

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: Not pertinent
9.3 Boiling Point at 1 atm: 192.0°F = 88.9°C = 362.1°K
9.4 Freezing Point: –50°F = –45.6°C = 227.6°K
9.5 Critical Temperature: Not pertinent
9.6 Critical Pressure: Not pertinent
9.7 Specific Gravity: 1.49 at 20°C (liquid)
9.8 Liquid Surface Tension: Not pertinent
9.9 Liquid Water Interfacial Tension: Not pertinent
9.10 Vapor (Gas) Specific Gravity: Not pertinent
9.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.248
9.12 Latent Heat of Vaporization: 214 Btu/lb = 119 cal/g = 4.98 X 10^5 J/kg
9.13 Heat of Combustion: Not pertinent
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: –205 Btu/lb = –114 cal/g = –4.76 X 10^5 J/kg
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: 1.9 psia

NOTES

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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
35	95.139	51	0.470		N		N
40	94.830	52	0.471		O		O
45	94.520	53	0.472		T		T
50	94.209	54	0.472				
55	93.910	55	0.473		P		P
60	93.599	56	0.473		E		E
65	93.290	57	0.474		R		R
70	92.990	58	0.474		T		T
75	92.679	59	0.475		I		I
80	92.370	60	0.475		N		N
85	92.070	61	0.476		E		E
90	91.759	62	0.477		N		N
95	91.450	63	0.477		T		T
		64	0.478				
		65	0.478				
		66	0.479				
		67	0.479				
		68	0.480				
		69	0.480				
		70	0.481				
		71	0.482				
		72	0.482				
		73	0.483				
		74	0.483				
		75	0.484				
		76	0.484				

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
	M	80	1.291	80	0.01404	0	0.206
	I	85	1.489	85	0.01605	10	0.209
	S	90	1.713	90	0.01829	20	0.213
	C	95	1.964	95	0.02078	30	0.216
	I	100	2.246	100	0.02355	40	0.219
	B	105	2.560	105	0.02662	50	0.223
	L	110	2.912	110	0.03000	60	0.226
	E	115	3.303	115	0.03374	70	0.229
		120	3.737	120	0.03784	80	0.232
		125	4.218	125	0.04235	90	0.236
		130	4.750	130	0.04728	100	0.239
		135	5.336	135	0.05267	110	0.242
		140	5.981	140	0.05855	120	0.246
		145	6.690	145	0.06494	130	0.249
		150	7.467	150	0.07189	140	0.252
		155	8.317	155	0.07943	150	0.255
		160	9.246	160	0.08758	160	0.259
		165	10.260	165	0.09640	170	0.262
		170	11.360	170	0.10590	180	0.265
		175	12.560	175	0.11610	190	0.269
		180	13.860	180	0.12720	200	0.272
						210	0.275
						220	0.278
						230	0.282
						240	0.285
						250	0.288