ETHYLENEIMINE

ETI

CAUTIONARY RESPONSE INFORMATION

Common Synonyms
Azirane
Aziridine

Oily liquid | Colorless | Ammonia odor

Floats and mixes with water. Poisonous, flammable vapor is produced.

Evacuate.
Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR.
Avoid inhalation.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Shut off ignition sources and call fire department.
Stay upwind and use water spray to ``knock down'' vapor.
Notify local health and pollution control agencies.
Protect water intakes.

Fire

FLAMMABLE.
Containers may explode when heated.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Combat fires from behind barrier.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED.
Irritating to eyes.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.
Will burn eyes.
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.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
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

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.
2.2 Formula: CH_2CH_2NH
2.3 IMO/UN Designation: 3.2/1185
2.4 DOT ID No.: 1185
2.5 CAS Registry No.: 151-56-4
2.6 NAERG Guide No.: 131P
2.7 Standard Industrial Trade Classification: 51451

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: If exposure is possible, wear full protective clothing (neoprene slicker suit, rubber boots, rubber gloves, chemical goggles). If vapors may be present, wear all-purpose canister or gas mask; if vapors are known to be present, use self-contained breathing apparatus.
3.2 Symptoms Following Exposure: Material gives inadequate warning of overexposure by respiration or skin contact. May cause nausea, vomiting, and possibly death when inhaled, ingested, or absorbed through skin. Severe blistering agent; can produce third-degree chemical burns of skin. Has corrosive effect on mucous membranes and may cause scarring of esophagus if swallowed. Corrosive to eye tissue; may cause permanent corneal opacity and conjunctival scarring. Effects on eye tissue, mucous membrane, and skin may be delayed.
3.3 Treatment of Exposure: INHALATION: remove victim from exposure and administer oxygen; steriod therapy (by physician) is recommended. SKIN OR EYES: prompt and adequate irriga- tion with water (within 60 seconds of exposure) can prevent serious injury.
3.4 TLV-TWA: 0.5 ppm
3.5 TLV-STEL: Not listed.
3.6 TLV-Ceiling: Not listed.
3.7 Toxicity by Ingestion: Grade 4; LD_{50} below 50 mg/kg (rat)
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: Causes cancer in mice. Effects on man unknown.
3.10 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
3.11 Liquid or Solid Characteristics: Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.
3.12 Odor Threshold: Currently not available
3.13 IDLH Value: 100 ppm
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: 1°F O.C.
: 12°F C.C.
4.2 Flammable Limits in Air: 3.3%-54.8%
4.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
4.5 Special Hazards of Combustion Products: Irritating vapors generated when heated.
4.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. May polymerize in fires with evolution of heat and container rupture.
4.7 Auto Ignition Temperature: 608°F
4.8 Electrical Hazards: Not pertinent
4.9 Burning Rate: Currently not available
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichometric Air to Fuel Ratio: 20.2 (calc.)
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): 5.5 (calc.)
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: Mild reaction, non-hazardous
5.2 Reactivity with Common Materials: Contact with silver or aluminum may cause polymerization.
5.3 Stability During Transport: Stable unless heated under pressure.
5.4 Neutralizing Agents for Acids and Caustics: Flush with water
5.5 Polymerization: Explosive polymerization can occur when in contact with acids.
5.6 Inhibitor of Polymerization: None used

6. WATER POLLUTION

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

7. SHIPPING INFORMATION

7.1 Grades of Purity: 99.0%
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: Inerted
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: Poison
8.2 49 CFR Class: 6.1
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).....	3
Instability (Yellow).....	3

8.6 EPA Reportable Quantity: 1 pound
8.7 EPA Pollution Category: X
8.8 RCRA Waste Number: P054
8.9 EPA FWPCA List: Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: 43.07
9.3 Boiling Point at 1 atm: 133°F = 56°C = 329°K
9.4 Freezing Point: –108°F = –78°C = 195°K
9.5 Critical Temperature: Not pertinent
9.6 Critical Pressure: Not pertinent
9.7 Specific Gravity: 0.832 at 20°C (liquid)
9.8 Liquid Surface Tension: 34.5 dynes/cm = 0.0345 N/m at 20°C
9.9 Liquid Water Interfacial Tension: Not pertinent
9.10 Vapor (Gas) Specific Gravity: 1.5
9.11 Ratio of Specific Heats of Vapor (Gas): 1.192
9.12 Latent Heat of Vaporization: 333 Btu/lb = 185 cal/g = 7.75 X 10^5 J/kg
9.13 Heat of Combustion: –15,930 Btu/lb = –8850 cal/g = –370.5 X 10^5 J/kg
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: (est.) –26 Btu/lb = –14 cal/g = –0.6 X 10^5 J/kg
9.16 Heat of Polymerization: (est.) –900 Btu/lb = –500 cal/g = –20 X 10^5 J/kg
9.17 Heat of Fusion: Currently not available
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: 8.6 psia

NOTES

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9.20 SATURATED LIQUID DENSITY	
Temperature (degrees F)	Pounds per cubic foot
0	54.060
10	53.750
20	53.430
30	53.120
40	52.810
50	52.500
60	52.190
70	51.870
80	51.561
90	51.250
100	50.940
110	50.620
120	50.310
130	50.000

9.21 LIQUID HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
20	0.563
30	0.569
40	0.575
50	0.581
60	0.587
70	0.593
80	0.599
90	0.605
100	0.611
110	0.618
120	0.624
130	0.630

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
	NOT PERTINENT

9.24 SOLUBILITY IN WATER	
Temperature (degrees F)	Pounds per 100 pounds of water
	MISCIBLE

9.25 SATURATED VAPOR PRESSURE	
Temperature (degrees F)	Pounds per square inch
-20	0.143
-10	0.220
0	0.330
10	0.483
20	0.693
30	0.976
40	1.349
50	1.835
60	2.458
70	3.246
80	4.232
90	5.451
100	6.942
110	8.747
120	10.910
130	13.490
140	16.530
150	20.080
160	24.220
170	29.000
180	34.480
190	40.740
200	47.840
210	55.850

9.26 SATURATED VAPOR DENSITY	
Temperature (degrees F)	Pounds per cubic foot
-20	0.00131
-10	0.00196
0	0.00288
10	0.00413
20	0.00580
30	0.00799
40	0.01083
50	0.01444
60	0.01897
70	0.02459
80	0.03147
90	0.03979
100	0.04976
110	0.06160
120	0.07553
130	0.09177
140	0.11060
150	0.13220
160	0.15680
170	0.18480
180	0.21630
190	0.25160
200	0.29100
210	0.33460

9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	0.246
25	0.261
50	0.276
75	0.290
100	0.305
125	0.319
150	0.333
175	0.346
200	0.360
225	0.373
250	0.386
275	0.399
300	0.411
325	0.423
350	0.435
375	0.447
400	0.459
425	0.470
450	0.481
475	0.492
500	0.503
525	0.513
550	0.523
575	0.533
600	0.543