

ETHYL SILICATE

ESC

CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Watery liquid Ethyl orthosilicate Ethyl silicate 40 Ethyl silicate condensed Silibond Tetraethyl orthosilicate Tetraethyl silicate	Colorless May float or sink in water. Reacts slowly with water.	Mild odor
<p>Keep people away. Avoid inhalation. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</p>			
Fire	Combustible. Extinguish with water, dry chemicals, foam, or carbon dioxide.		
Exposure	Call for medical aid. LIQUID Irritating to eyes. If swallowed will cause nausea and vomiting. 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 and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. 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: Burn

2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
2.2 Formula: $(C_2H_5O)_2Si$
2.3 IMO/UN Designation: 3.3/1292
2.4 DOT ID No.: 1292
2.5 CAS Registry No.: 78-10-4
2.6 NAERG Guide No.: 132
2.7 Standard Industrial Trade Classification: 51550

3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Rubber or polyethylene gloves; safety glasses or other form of eye protection; self-contained breathing apparatus or one that absorbs organic vapors.
3.2 Symptoms Following Exposure: Inhalation of vapor causes eye and nose irritation, unsteadiness, tremors, salivation, respiratory difficulty, and unconsciousness. Contact with liquid irritates eyes and may cause dryness, cracking, and inflammation of skin. Ingestion may produce nausea, vomiting, and cramps.
3.3 Treatment of Exposure: INHALATION: move patient from contaminated atmosphere; if his breathing has ceased, start mouth-to-mouth artificial respiration; oxygen, if available, should be administered only by an experienced person when authorized by a physician; keep patient warm and comfortable; call physician immediately. EYES: flush immediately with large quantities of running water for at least 15 min.; obtain medical attention if irritation persists. SKIN: immediately flush affected areas with large volumes of water; obtain medical attention if irritation persists. INGESTION: give large amounts of water or warm salty water and induce vomiting; milk, eggs or olive oil may then be given; obtain medical attention if abdominal discomfort persists.
3.4 TLV-TWA: 10 ppm
3.5 TLV-STEL: Not listed.
3.6 TLV-Ceiling: Not listed.
3.7 Toxicity by Ingestion: Currently not available
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: Liver, kidney, and lung damage may result from overexposures by inhalation or ingestion.
3.10 Vapor (Gas) Irritant Characteristics: Currently not available
3.11 Liquid or Solid Characteristics: Currently not available
3.12 Odor Threshold: 85 ppm
3.13 IDLH Value: 700 ppm
3.14 OSHA PEL-TWA: 100 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: 125°F O.C. 99°F C.C.
4.2 Flammable Limits in Air: 1.3%-23%
4.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available
4.5 Special Hazards of Combustion Products: Not pertinent
4.6 Behavior in Fire: Not pertinent
4.7 Auto Ignition Temperature: Currently not available
4.8 Electrical Hazards: Currently not available
4.9 Burning Rate: 4.4 mm/min.
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichiometric Air to Fuel Ratio: 57.1 (calc.)
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): 19.0 (calc.)
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Reacts slowly, forming non-toxic silica and ethyl alcohol.
5.2 Reactivity with Common Materials: Causes swelling and hardening of some plastics.
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: 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: Bioaccumulation: -
Damage to living resources: -
Human Oral hazard: 0
Human Contact hazard: I
Reduction of amenities: X

7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 90-99%
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: No requirement
7.4 Venting: Open (flame arrester)
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 liquid
8.2 49 CFR Class: 3
8.3 49 CFR Package Group: III
8.4 Marine Pollutant: No
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
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 FWCRA List: Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15°C and 1 atm: Liquid
9.2 Molecular Weight: 208.3
9.3 Boiling Point at 1 atm: 336°F = 169°C = 442°K
9.4 Freezing Point: -121.9°F = -85.5°C = 187.7°K
9.5 Critical Temperature: Not pertinent
9.6 Critical Pressure: Not pertinent
9.7 Specific Gravity: 0.933 at 20°C (liquid)
9.8 Liquid Surface Tension: 22.8 dynes/cm = 0.0228 N/m at 20°C
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): Not pertinent
9.12 Latent Heat of Vaporization: 95 Btu/lb = 53 cal/g = 2.2 X 10⁴ J/kg
9.13 Heat of Combustion: (est.) -12,000 Btu/lb = -6,700 cal/g = -280 X 10³ 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: Currently not available

NOTES

ETHYL SILICATE

ESC

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	59.380	52	0.430	51	1.048	55	0.764
40	59.210	54	0.430	52	1.048	60	0.737
45	59.040	56	0.430	53	1.048	65	0.712
50	58.860	58	0.430	54	1.048	70	0.689
55	58.690	60	0.430	55	1.048	75	0.666
60	58.520	62	0.430	56	1.048	80	0.645
65	58.340	64	0.430	57	1.048	85	0.625
70	58.170	66	0.430	58	1.048	90	0.606
75	58.000	68	0.430	59	1.048	95	0.587
80	57.820	70	0.430	60	1.048	100	0.570
85	57.650	72	0.430	61	1.048	105	0.553
90	57.480	74	0.430	62	1.048	110	0.537
95	57.300	76	0.430	63	1.048	115	0.522
100	57.130	78	0.430	64	1.048	120	0.508
105	56.960	80	0.430	65	1.048	125	0.494
110	56.780	82	0.430	66	1.048	130	0.481
115	56.610	84	0.430	67	1.048	135	0.468
120	56.440	86	0.430	68	1.048	140	0.456
125	56.260	88	0.430	69	1.048	145	0.444
130	56.090	90	0.430	70	1.048	150	0.433
135	55.920	92	0.430	71	1.048	155	0.422
140	55.740	94	0.430	72	1.048		
145	55.570	96	0.430	73	1.048		
150	55.400	98	0.430	74	1.048		
155	55.220	100	0.430	75	1.048		
		102	0.430	76	1.048		

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
R	60	0.029	60	0.00110		N	
E	70	0.041	70	0.00151		O	
A	80	0.057	80	0.00206		T	
C	90	0.078	90	0.00276			
T	100	0.106	100	0.00367		P	
S	110	0.142	110	0.00483		E	
	120	0.188	120	0.00629		R	
	130	0.247	130	0.00812		T	
	140	0.321	140	0.01039		I	
	150	0.414	150	0.01318		N	
	160	0.529	160	0.01658		O	
	170	0.672	170	0.02071		T	
	180	0.847	180	0.02568			
	190	1.059	190	0.03163			
	200	1.316	200	0.03870			
	210	1.624	210	0.04705			
	220	1.992	220	0.05687			
	230	2.429	230	0.06835			
	240	2.945	240	0.08169			
	250	3.552	250	0.09713			
	260	4.262	260	0.11490			
	270	5.087	270	0.13530			
	280	6.044	280	0.15850			
	290	7.147	290	0.18500			
	300	8.415	300	0.21490			
	310	9.865	310	0.24870			