CARBON MONOXIDE

**CAUTIONARY RESPONSE INFORMATION**

<table>
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<tr>
<th>Common Synonyms</th>
<th>Chemical Name</th>
<th>Physical State</th>
<th>Odor</th>
<th>Reaction to Water</th>
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<td>Odorless</td>
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<td></td>
<td></td>
<td></td>
<td>Liquid floats and boils on water. Poisonous, flammable visible vapor cloud is produced.</td>
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**Fire**

- FLAMMABLE: Containers may explode in fire. Wear goggles, self-contained breathing apparatus, and rubber overshoes (including gloves).
- CALL FOR MEDICAL AID. If breathing has stopped, give artificial respiration. Cool exposed containers and protect men effecting shutoff with water.

**Exposure**

- CALL FOR MEDICAL AID. Poisonous if inhaled. May cause respiratory reaction or collapse. Contact of liquid with skin will cause frostbite.
- INHALATION: remove from exposure; give oxygen if available; support breathing (est.).

**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**

- Stop discharge.
- Chemical and Physical Treatment: Benzene.
- 3.1 Personal Protective Equipment: Self-contained breathing apparatus; safety glasses and safety shoes; Type D or Type N rubber mask.
- 3.2 Symptoms Following Exposure: Inhalation causes headache, dizziness, weakness of limbs, confusion, nausea, unconsciousness, and finally death. 0.04% conc., 2-3 hr. or 0.26% conc., 1 hr.-headache and discomfort; with moderate exercise, 0.1-0.2% will produce throbbing in the head in about 1/2 hr., a tendency to stagger in about 1 1/2 hr., and confusion of the mind, headache, and nausea in about 2 hrs. 0.20-25% usually produce unconsciousness in about 1/2 hr. Inhalation of a 0.4% conc. can prove fatal in less than 1 hr. Inhalation of high concentrations can cause sudden, unexpected collapse. Contact of liquid with skin will cause frostbite.
- 3.3 Treatment of Exposure: INHALATION: remove from exposure; give oxygen if available; support respiration; call a doctor. SKIN: If burned by liquid, treat as frostbite.
- 3.4 TLV-TWA: 25 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Not pertinent (gas with low boiling point).
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Toxicity from overexposure persists for many days.
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available.
- 3.11 Liquid or Solid Characteristics: Currently not available.
- 3.12 Odor Threshold: Odorous.
- 3.13 IDLH Value: 1,200 ppm.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed.

**2. CHEMICAL DESIGNATIONS**

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: CO
- 2.3 IMO/UN Designation: 2/1016
- 2.4 DOT No.: 1016
- 2.5 CAS Registry No.: 630-08-0
- 2.6 NAERG Guide No.: 119
- 2.7 Standard Industrial Trade Classification: 52339

**3. HEALTH HAZARDS**

- 3.1 Personal Protective Equipment: Self-contained breathing apparatus; safety glasses and safety shoes; Type D or Type N rubber mask.
- 3.2 Symptoms Following Exposure: Inhalation causes headache, dizziness, weakness of limbs, confusion, nausea, unconsciousness, and finally death. 0.04% conc., 2-3 hr. or 0.26% conc., 1 hr.-headache and discomfort; with moderate exercise, 0.1-0.2% will produce throbbing in the head in about 1/2 hr., a tendency to stagger in about 1 1/2 hr., and confusion of the mind, headache, and nausea in about 2 hrs. 0.20-25% usually produce unconsciousness in about 1/2 hr. Inhalation of a 0.4% conc. can prove fatal in less than 1 hr. Inhalation of high concentrations can cause sudden, unexpected collapse. Contact of liquid with skin will cause frostbite.
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**4. FIRE HAZARDS**

- 4.1 Flash Point: Not pertinent
- 4.2 Flammable Limits in Air: 12-75%.
- 4.3 Fire Extinguishing Agents: Let fire burn; shut off flow of gas and cool adjacent exposures with water. Extinguish only if wearing self-contained breathing apparatus with dry chemicals or carbon dioxide.
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Asphyxiation due to carbon dioxide production may result.
- 4.6 Behavior in Fire: Flame has very little color. Containers may explode in fire.
- 4.7 Auto-Ignition Temperature: 1,128°F
- 4.8 Electrical Hazards: Currently not available.
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: 2700°F (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

**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 Corrosivants: None
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

**6. WATER POLLUTION**

- 6.1 Aquatic Toxicity: Not pertinent
- 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: Not listed

**7. SHIPPING INFORMATION**

- 7.1 Grades of Purity: Liquid: 98.6+%; Gas: Research High Purity; CP (99.6%); Technical (99.5%); Commercial (97.5%).
- 7.2 Storage Temperature: Ambient (for gas); Refrigerated (for liquid).
- 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 40 CFR Category: Poison Gas
- 8.2 40 CFR Class: 2.3
- 8.3 40 CFR Package Group: Not pertinent
- 8.4 Marine Pollution: None
- 8.5 NFPA Hazard Classification: Category Classification Health Hazard (Blue)........ 2 Flammability (Red)............. 4 Reactivity (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: 28.0
- 9.3 Boiling Point at 1 atm: –312.7°F = –191.5°C = –81.7K
- 9.4 Freezing Point: –305°F = –199°C = 74°K
- 9.5 Critical Temperature: –220°F = –140°C = 133°K
- 9.6 Critical Pressure: 507.5 psia = 34.51 atm = 8,552 kN/m²
- 9.7 Specific Gravity: 0.791 at –191.5°C (liquid)
- 9.8 Liquid Surface Tension: 9.8 dynes/cm = 0.009 N/m at –193°C
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Currently not available
- 9.11 Ratio of Specific Heats of Vapor (Gas): 1.3962
- 9.12 Latent Heat of Vaporization: 92.8 Btu/lb = 0.816 cal/g = 2.16 X 10⁵ 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: 7.13 cal/g
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

**NOTES**

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<th>Temperature (degrees F)</th>
<th>Pounds per cubic foot</th>
<th>Temperature (degrees F)</th>
<th>British thermal unit per pound-F</th>
<th>Temperature (degrees F)</th>
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**OC**

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