EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all ignition sources. Notify manufacturer or supplier. Dike to prevent runoff. Stop or reduce discharge if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

Eye protection - goggles or face shield. Gloves - rubber. Boots - rubber. Clothing - suitable for situation.

Fire and Explosion

Use dry chemical, alcohol foam or carbon dioxide to extinguish. Water may be ineffective on fire but may be used to cool fire-exposed containers.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Contact: wash eyes and skin with water and remove contaminated clothing. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Ingestion: give water to conscious victim to drink and induce vomiting. If medical attention is considered necessary, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

ETHYLBENZENE $C_6H_5CH_2CH_3$

IDENTIFICATION

UN No. 1175

Common Synonyms	Observable Characteristics	Manufacturers
PHENYLETHANE EB ETHYLBENZOL	Clear, colourless liquid with an aromatic odour.	Polysar, Sarnia, Ontario. Dow Chemical Canada Inc., Sarnia, Ontario.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable liquid.
Inert Atmosphere: No requirement.
Venting: Open (flame arrester) or pressure vacuum.
Pump Type: Gear or centrifugal, explosion-proof, grounded.

Label(s): Red and white label - FLAMMABLE LIQUID; Class 3.2, Group II.
Storage Temperature: Ambient.
Hose Type: Viton, polypropylene, Teflon, neoprene.

Grades or Purity: Pure grade, 99.5%; technical grade, 99.0%.
Containers and Materials: Drums, tank cars, tank trucks; steel, stainless steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 0.014 g/100 mL (15°C); 0.021 g/100 mL (25°C).
Molecular Weight: 106.2
Vapour Pressure: 7 mm Hg (20°C); 12 mm Hg (30°C).
Boiling Point: 136.2°C.

Floatability (Water): Floats.
Odour: Aromatic (140 ppm, odour threshold).
Flash Point: 15°C (c.c.).
Vapour Density: 3.7
Specific Gravity: 0.87 at 20°C.

Colour: Colourless.
Explosive Limits: 1.0 to 6.7%.
Melting Point: -95°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of mucous membranes, headache, dizziness, narcosis and coma. Ingestion: symptoms similar to inhalation. Contact: skin - irritation, defatting and dermatitis; eyes - irritation and burning.
Toxicology: Moderately toxic by inhalation, contact and ingestion.

TLV® - (inhalation) 100 ppm; 435 mg/m^3.
Short-term Inhalation Limits - 125 ppm; 545 mg/m^3 (15 min).

LC_{50} - No information.
LC_{Lo} - Inhalation: rat = 4 000 ppm/4 h
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 3.5 g/kg

Fire

Fire Extinguishing Agents: Use foam, dry chemical or carbon dioxide. Water may be ineffective but may be used to cool fire-exposed containers and knock down vapours.
Behaviour in Fire: Flashback may occur along vapour trail.
Ignition Temperature: 432°C.
Burning Rate: 5.8 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Can react with oxidizing materials.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 29 ppm/96 h/bluegill/TLm/freshwater; 32 to 35.1 ppm/48 h/bluegill/TLm/freshwater; 42.3 mg/L/48 h/fathead minnow/TLm/hard water; 14 mg/L/96 h/rainbow trout/LC_{50}/freshwater; BOD: 2.8% 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warnings: "FLAMMABLE". Call Fire Department. Eliminate all sources of ignition. Call manufacturer. Shut off leak if safe to do so. Dike to prevent runoff. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated protective clothing.

Fire and Explosion

Use foam, dry chemical or carbon dioxide to extinguish. Water may be ineffective, but may be used to cool fire-exposed containers and knock down vapours. Flashback may occur along vapour trail. Do not extinguish fire until leak stopped.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if breathing has stopped; oxygen if laboured. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with water. Ingestion: do not induce vomiting. If medical assistance is not immediately available, transport victim to doctor, hospital or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Adsorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

ETHYL CHLORIDE C_2H_5Cl

IDENTIFICATION

UN No. 1037

Common Synonyms	Observable Characteristics	Manufacturers
CHLOROETHANE MONOCHLOROETHANE HYDROCHLORIC ETHER	Colourless liquid or gas. Ethereal odour.	Ethyl Corporation of Canada Ltd., Corunna, Ontario. Dow Chemical Canada Inc., Sarnia, Ontario Originating from: Dow Chemical, Freeport, TX.

Transportation and Storage Information

Shipping State: Liquid (compressed gas).
Classification: Flammable gas.
Inert Atmosphere: No requirement.
Venting: Safety relief.
Pump Type: Centrifugal, positive displacement or gear. Steel, stainless steel.

Label(s): Red label - FLAMMABLE GAS; Class 2.1.
Storage Temperature: Ambient.
Hose Type: Teflon, Viton A, flexible stainless steel.

Grades or Purity: Technical, 99.5 to 100%; USP, 100%.
Containers and Materials: Cylinders, tank cars, tank trucks (pressure vessels). Steel, stainless steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas.
Solubility (Water): Reacts to form HCl. 0.33 g/100 mL (0°C); 0.57 g/100 mL (20°C).
Molecular Weight: 64.5
Vapour Pressure: 457 mm Hg (0°C); 700 mm Hg (10°C); 1 000 mm Hg (20°C); 1 444 mm Hg (30°C).
Boiling Point: 12.3°C.

Floatability (Water): Floats and reacts.
Odour: Ethereal.
Flash Point: -43°C (o.c.); -50°C (c.c.).
Vapour Density: 2.2
Specific Gravity: 0.89 (25°C).

Colour: Colourless.
Explosive Limits: 3.8 to 15.4%.
Melting Point: -136 to -139°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: dizziness, disorientation, incoordination, narcosis, nausea or vomiting. Ingestion: similar to inhalation. Contact: skin - pain, irritation, defatting, frostbite; may be absorbed; eyes - pain and irritation, frostbite burn.
Toxicology: Moderately toxic by inhalation, ingestion and contact.

TLV* - (inhalation) 1 000 ppm; 2 600 mg/m^3. Short-term Inhalation Limits - 1 250 ppm; 3 250 mg/m^3 (15 min).

LC_{50} - No information.
LC_{Lo} - Inhalation: guinea pig = 4 000 ppm/45 min
Delayed Toxicity - No information.

LD_{50} - No information.

Fire

Fire Extinguishing Agents: Stop or reduce discharge before attempting to extinguish fire. Use carbon dioxide or dry chemical to extinguish small fires. Water spray, fog, or foam may be necessary on large fires. Use water to cool fire-exposed containers.
Behaviour in Fire: Vessels may rupture. Decomposition from heat or fire produces toxic hydrochloric acid fumes and phosgene. Flashback may occur along vapour trail.
Ignition Temperature: 519°C.
Burning Rate: 3.8 mm/min.

Reactivity

With Water: Reacts with water and steam to produce hydrochloric acid.
With Common Materials: Can react vigorously with oxidizing materials. Reacts violently with alkaline metals, magnesium, aluminum and zinc.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating: >1 000 ppm/96 h/TLm/freshwater; BOD: No information.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". Call Fire Department. Eliminate all sources of ignition. Call manufacturer for advice. Avoid contact and inhalation. If material is burning, use water spray to knock down vapours and fumes; work from upwind. If water spray is used, dike area to contain toxic runoff. Stop or reduce discharge if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Boots - high, rubber (pants worn outside boots). Gloves - rubber or plastic.

Fire and Explosion

Stop or reduce discharge before attempting to extinguish fire. Use carbon dioxide to extinguish. Use water to cool fire-exposed containers. Flashback may occur along vapour trail.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if breathing has stopped; give oxygen if breathing is laboured. Contact: remove contaminated clothing. Wash eyes and affected skin with plenty of warm water for at least 15 minutes. Do not rub areas which appear to have been frostbitten. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

Control - favourable conditions
1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If floating, skim and remove.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Control - not possible
1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

Control - favourable conditions
1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Adsorb residual liquid on natural or synthetic sorbents.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Control - not possible
1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

ETHYLENE C_2H_4

IDENTIFICATION

UN No. 1962

Common Synonyms	Observable Characteristics	Manufacturers
ETHENE OLEFIANT GAS	Colourless liquid or gas. Sweet odour.	Esso Chemicals Canada Ltd., Sarnia, Ontario. Gulf Oil Canada Ltd., Varennes, Quebec. Alberta Gas, Joffre, Alberta. Petrosar Ltd., Corunna, Ontario. Dow chemical Canada Inc., Sarnia, Ont., Fort Saskatchewan, Alta.

Transportation and Storage Information

Shipping State: Liquid (compressed gas).
Classification: Flammable gas.
Inert Atmosphere: No requirement.
Venting: Safety relief.

Label(s): Red label - FLAMMABLE GAS; Class 2.1.
Storage Temperature: Ambient (gas); -104°C (liquid).
Hose Type: Teflon bore 304 stainless steel (300-1 400 psig).

Grades or Purity: Technical, 98 to 99%; CP 99.5 to 100%.
Containers and Materials: Cylinders, tube trailers, tank trucks (under special permit), tank cars; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas.
Solubility (Water): 0.013 g/100 mL (20°C).
Molecular Weight: 28.1
Vapour Pressure: 30 400 mm Hg (0°C).
Boiling Point: -103.9°C.

Floatability (Water): Floats and boils.
Odour: Sweet (260 to 700 ppm, odour threshold).
Flash Point: -136°C approximately.
Vapour Density: 0.98 (0°C)
Specific Gravity: 0.57 (-104°C); 0.61 (0°C).

Colour: Colourless.
Explosive Limits: 2.7 to 36%.
Melting Point: -169.2°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: headache, drowsiness, dizziness, weakness, narcosis, nausea and vomiting, asphyxia. Contact: skin - liquid can cause frostbite; eyes - pain, burning.
Toxicology: Moderately toxic by inhalation.
TLV® - (inhalation) Asphyxiant.
Short-term Inhalation Limits - No information.

LC_{50} - Inhalation: mouse = 950 000 ppm.
Delayed Toxicity - None known.

LD_{50} - No information.

Fire

Fire Extinguishing Agents: Stop flow of gas before attempting extinguishment. Use carbon dioxide, dry chemical or water fog. Use water to cool fire-exposed containers.
Behaviour in Fire: Flashback may occur along vapour trail.
Ignition Temperature: 450°C.
Burning Rate: 7.4 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Can react vigorously with oxidizing materials. Reacts violently with aluminum chloride, bromotrichloromethane, carbon tetrachloride, chlorine, chlorine dioxide, nitrogen dioxide and ozone. May react with acids.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 22 ppm/1 h/sunfish/killed/freshwater; Aquatic toxicity rating = 100 to 1 000 ppm/96 h/TLm/freshwater; BOD: No information.
Land-Air: Concentrations of 0.5 to 4 ppm cause leaf loss; 0.1 to 0.5 ppm causes growth retardation or inhibits flower opening.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away. Issue warning: "FLAMMABLE". Call Fire Department. Eliminate sources of ignition. Avoid contact and inhalation. Work from upwind and use water spray to control vapour. Stop or reduce discharge if this can be done without risk. Notify manufacturer or supplier. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus. Gloves - rubber or plastic. Acid suit - jacket and pants; rubber or plastic. Boots - high, rubber (pants worn outside boots).

Fire and Explosion

Stop flow of gas before attempting extinguishment. Use carbon dioxide, dry chemical or water fog to extinguish. Use water to cool fire-exposed containers. Flashback may occur along vapour trail.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if breathing has stopped; give oxygen if breathing is laboured. Contact: remove contaminated clothing and wash eyes and affected skin thoroughly with plenty of warm water. Do not rub affected areas. Keep victim warm and quiet. If medical assistance is not immediately available, transport victim to hospital, clinic or doctor.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water-Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

ETHYLENEDIAMINE $NH_2CH_2CH_2NH_2$

IDENTIFICATION

UN No. 1604

Common Synonyms	Observable Characteristics	Manufacturers
1,2 DIAMINOETHANE 1,2 ETHANEDIAMINE	Colourless liquid. Ammonia-like odour.	No Canadian manufacturer. Canadian supplier: Dow Chemical Canada Inc., Sarnia, Ontario. Originating from: Dow Chemical, Midland, MI.

Transportation and Storage Information

Shipping State: Liquid. **Classification:** Corrosive liquid. **Inert Atmosphere:** No requirement. **Venting:** Pressure-vacuum. **Pump Type:** Centrifugal or positive displacement; stainless steel.	**Label(s):** Black and white label - CORROSIVE; Class 8, Group II. **Storage Temperature:** Ambient. **Hose Type:** Natural rubber, Viton, butyl, flexible stainless steel. No bronze, brass or copper alloy fittings.	**Grades or Purity:** Technical, 97+%. **Containers and Materials:** Drums (tin-lined), tank trucks; stainless steel, aluminum.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility** (Water): Completely soluble. **Molecular Weight:** 60.1 **Vapour Pressure:** 9 mm Hg (20°C); 16 mm Hg (30°C). **Boiling Point:** 115-119°C.	**Floatability** (Water): Floats and mixes. **Odour:** Ammonia-like odour (1.0 to 11.2 ppm, odour threshold). **Flash Point:** 50-66°C (o.c.); 40-43°C (c.c.). **Vapour Density:** 2.1 **Specific Gravity:** 0.90 (20°C).	**Colour:** Colourless. **Explosive Limits:** 4.2 to 14.4% (2.5 to 12% at 100°C). **Melting Point:** 11°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: intense respiratory tract irritation, headache, dizziness, shortness of breath. Contact: burns to skin and eyes. Ingestion: irritation to digestive tract, nausea and vomiting.
Toxicology: Highly toxic by inhalation and ingestion; moderately toxic by skin contact.

TLV®- (inhalation) 10 ppm; 25 mg/m^3. Short-term Inhalation Limits - No information.	LC_{50} - Inhalation: rat = 4 000 ppm/8 h Delayed Toxicity - No information.	LD_{50} - Oral: guinea pig = 0.47 g/kg Oral: rat = 1.16 g/kg

Fire

Fire Extinguishing Agents: Use carbon dioxide, dry chemical or alcohol foam. Water spray may be ineffective, but may be used to cool fire-exposed containers and knock down vapours.
Behaviour in Fire: Irritating NO_x gases may be generated.

Ignition Temperature: 380-400°C.	**Burning Rate:** 2.2 mm/min.

Reactivity

With Water: No reaction; soluble.
With Common Materials: May react with oxidizing materials. Reacts violently with acetic acid, acetic anhydride, acrolein, acrylic acid, acrylonitrile, allyl chloride, carbon disulfide, chlorosulfonic acid, epichlorohydrin, hydrochloric acid, nitric acid, oleum, silver perchlorate, sulfuric acid and vinyl acetate.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life in very low concentrations. Fish toxicity: 30 to 60 ppm/24 h/creek chub/killed/freshwater; Aquatic toxicity rating = 10 to 100 ppm/96 h/TLm/freshwater; BOD: 75%, 5 days (theoretical).
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE. FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warnings: "CORROSIVE; FLAMMABLE". Call Fire Department. Avoid contact and inhalation. If water is used to control fire, dike area to prevent runoff. Notify supplier. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated protection suit. Boots - high, rubber (pants worn outside boots). Gloves - rubber.

Fire and Explosion

Use dry chemical, alcohol foam or carbon dioxide to extinguish. Water may be used to cool fire-exposed containers and knock down vapours.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if breathing has stopped; give oxygen if breathing is laboured. Contact: remove contaminated clothing. Wash eyes and skin with plenty of warm water for at least 30 minutes. Ingestion: give milk or water to conscious victim only. Do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Adsorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

ETHYLENE DIBROMIDE $BrCH_2CH_2Br$

IDENTIFICATION

UN No. 1605

Common Synonyms	Observable Characteristics	Manufacturers
EDB 1,2-DIBROMOETHANE ETHYLENE BROMIDE	Colourless liquid. Sweet odour.	No Canadian manufacturers. Canadian suppliers: Basile Import/Export, St. Laurent, Quebec. Chorney Chemical Co., Toronto, Ontario. Dow Chemical Canada Inc. Originating from: Dow Chemical, Magnolia, AR.

Transportation and Storage Information

Shipping State: Liquid. **Classification:** Poisonous liquid. **Inert Atmosphere:** No requirement. **Venting:** Pressure-vacuum. **Pump Type:** Centrifugal or positive displacement, steel or stainless steel.	**Label(s):** White label - POISON; Class 6.1, Group II. **Storage Temperature:** Ambient **Hose type:** stainless steel, Viton.	**Grades or Purity:** Commercial. **Containers and Materials:** Drums; steel. Tanks trucks, tank cars; steel (not aluminum).

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility (Water):** 0.431 g/100 mL (30°C) **Molecular Weight:** 187.9 **Vapour Pressure:** 11 mm Hg (20°C); 17 mm Hg (30°C) **Boiling Point:** 131 to 132°C.	**Floatability (Water):** Sinks. **Odour:** Sweet (26 ppm, odour threshold). **Flash Point:** Not flammable. **Vapour Density:** 6.5	**Colour:** Colourless. **Explosive Limits:** Not flammable. **Melting Point:** 9 to 10°C

HAZARD DATA

Human Health

Symptoms: Inhalation: shortness of breath, coughing, irritation of respiratory tract, nausea, vomiting, drowsiness, internal injury. Contact: skin - readily absorbed, inflammation, blisters and symptoms similar to inhalation. Ingestion: symptoms similar to inhalation.
Toxicology: Highly toxic by all routes.

TLV* - No information; contact should not be made with ethylene dibromide. Short-term Inhalation Limits - No information.	LC_{50} - No information. LC_{Lo} - Inhalation: rat = 400 ppm/2 h **Delayed Toxicity** - Suspected carcinogen.	LD_{50} - Oral: rat = 0.117 g/kg

Fire

Fire Extinguishing Agents: Not combustible. In fires involving ethylene bromide, use water spray, dry chemical, foam or carbon dioxide. Water may also be used to disperse vapours.
Behaviour in Fire: When heated to decomposition, emits highly toxic fumes of bromine and hydrogen bromide.

Ignition Temperature: Not combustible.	**Burning Rate:** Not combustible.

Reactivity

With Water: No reaction.
With Common Materials: Reacts violently with metal powders of aluminum, zinc and magnesium. May react with strong oxidizers.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 18 mg/L/48 h/bluegill/freshwater; BOD: No information.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "POISON". Avoid contact and inhalation. Notify manufacturer or supplier. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit.

Fire and Explosion

Not combustible. In fires involving ethylene dibromide, use water spray, dry chemical, foam or carbon dioxide to extinguish. Water may also be used to knock down vapours. When heated to decomposition, emits highly toxic fumes of bromide.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: If breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water for at least 15 minutes. Ingestion: give water to conscious victim to drink and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain spill by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Adsorb residual liquid on natural or synthetic sorbents.
7. Remove contaminated soil for disposal.
8. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

ETHYLENE DICHLORIDE $CH_2Cl \cdot CH_2Cl$

IDENTIFICATION

UN No. 1184

Common Synonyms	Observable Characteristics	Manufacturers
1,2-DICHLOROETHANE ETHYLENE CHLORIDE DUTCH OIL OR LIQUID	Clear, colourless liquid. Sweet, chloroform-like odour.	Dow Chemical Canada Inc., Sarnia, Ontario, Fort Saskatchewan, Alberta.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable liquid.
Inert Atmosphere: No requirement.
Venting: Pressure-vacuum.
Pump Type: Standard types for flammable liquids (centrifugal); steel or stainless steel.

Label(s): Red label - FLAMMABLE LIQUID; Class 3.2, Group II.
Storage Temperature: Ambient.
Hose Type: Flexible stainless steel, Teflon.

Grades or Purity: Commercial.
Containers and Materials: Drums, tank cars, trucks; steel, stainless steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 0.92 g/100 mL (0°C); 0.869 g/100 mL (20°C).
Molecular Weight: 99.0
Vapour Pressure: 40 mm Hg (10°C); 61 mm Hg (20°C); 105 mm Hg (30°C).
Boiling Point: 83.5°C.

Floatability (Water): Sinks.
Odour: Chloroform-like (6 to 40 ppm, odour threshold).
Flash Point: 18°C (o.c.); 13°C (c.c.).
Vapour Density: 3.4
Specific Gravity: 1.26 (20°C).

Colour: Colourless.
Explosive Limits: 6.2 to 16%.
Melting Point: -35.3 to -40°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of eyes, nose and throat, mental confusion, dizziness, nausea and vomiting, diarrhea, coma; damage to liver, lungs and nervous system. Ingestion: irritation of the gastrointestinal tract, nausea and vomiting. Contact: skin - absorbed readily, burning, with symptoms similar to inhalation; eyes - irritation, clouding of cornea.
Toxicology: Moderately to highly toxic by inhalation, ingestion and contact.

TLV* - (inhalation) 10 ppm; 40 mg/m^3.
Short-term Inhalation Limits - 15 ppm; 60 mg/m^3 (15 min).

LC_{50} - No information.
LC_{Lo} - Inhalation: human - 4 000 ppm/1 h
Delayed Toxicity - Suspected carcinogen and damage to the liver.

LD_{50} - Oral: rat = 0.68 g/kg
LC_{Lo} - Oral: human = 0.81 g/kg

Fire

Fire Extinguishing Agents: Use dry chemical, foam or carbon dioxide. Water may be ineffective, but may be used to cool fire-exposed containers and knock down vapours.
Behaviour in Fire: When heated to decomposition (or in fires) emits highly toxic fumes of phosgene, vinyl chloride and hydrochloric acid. Flashback may occur along vapour trail.
Ignition Temperature: 413°C.
Burning Rate: 1.6 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Can react vigorously with oxidizing materials. Reacts violently with aluminum, ammonia and dimethylaminopropylamine.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways; Fish toxicity: 225 mg/L/96 h/rainbow trout/LC_{50}/freshwater; 150 ppm/tns/pin perch/TLm/saltwater; Aquatic toxicity rating - 100-1 000 ppm; BOD: 0.002%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". Call Fire Department. Eliminate all sources of ignition. Avoid contact or inhalation. Contact manufacturer for guidance. Stop or reduce discharge, if this can be done without risk. Contain spill by diking. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit.

Fire and Explosion

Use dry chemical, foam or carbon dioxide. Water may be used to cool fire-exposed containers and knock down vapours. Flashback may occur along vapour trail. In fires, emits highly toxic fumes of phosgene, vinyl chloride and hydrochloric acid.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: eyes - irrigate with plenty of water for at least 15 minutes; skin - remove contaminated clothing and flush affected areas with plenty of water. Ingestion: give water or milk to conscious victim to drink. Do not induce vomiting. Keep victim warm and quiet. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with vacuum pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Adsorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

ETHYLENE GLYCOL CH_2OHCH_2OH

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
ANTIFREEZE GLYCOL MONOETHYLENE GLYCOL 1,2-ETHANEDIOL ETHYLENE DIHYDRATE	Colourless liquid. Slight odour.	Dow Chemical Canada Inc., Fort Saskatchewan, Alberta, Sarnia, Ontario. Union Carbide, Montreal, Quebec.

Transportation and Storage Information

Shipping State: Liquid. **Classification:** None. **Inert Atmosphere:** No requirement. **Venting:** Open (flame arrester). **Pump Type:** Most types.	**Label(s):** Not regulated. **Storage Temperature:** Ambient. **Hose Type:** Most types.	**Grades or Purity:** Industrial. **Containers and Materials:** Drums, tank cars, tank trucks; steel, stainless steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility** (Water): Soluble in all proportions. **Molecular Weight:** 62.1 **Vapour Pressure:** 0.05 mm Hg (20°C); 0.2 mm Hg (30°C). **Boiling Point:** 196 to 198°C.	**Floatability** (Water): Sinks and mixes. **Odour:** Slight (0.08 to 25 ppm, odour threshold). **Flash Point:** 116°C (o.c.); 111°C (c.c.). **Vapour Density:** 2.1 **Specific Gravity:** 1.11 (20°C).	**Colour:** Colourless. **Explosive Limits:** 3.2 to 15.3%. **Melting Point:** -13°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: intoxication, headache; prolonged inhalation may cause throat irritation and nervous system disorder. Ingestion: intoxication, headache, vomiting, cyanosis, unconsciousness with convulsions. Contact: skin - absorbed causing intoxication; eyes - irritation.
Toxicology: Moderately toxic by ingestion, contact and inhalation.

TLV* - 10 mg/m^3 (particulate); 50 ppm; 125 mg/m^3 (vapour). Short-term Inhalation Limits - 20 mg/m^3 (15 min) (particulate).	LC_{50} - No information. Delayed Toxicity - Fatal kidney injury may result from ingestion.	LD_{50} - Oral: rat = 5.84 g/kg

Fire

Fire Extinguishing Agents: Use water fog, alcohol foam, carbon dioxide, or dry chemical. Water or foam may cause frothing.
Behaviour in Fire: No information.

Ignition Temperature: 398°C.	**Burning Rate:** 1.0 mm/min.

Reactivity

With Water: No reaction, soluble.
With Common Materials: Can react violently with chlorosulfonic acid, oleum and sulfuric acid. May react with strong oxidizing materials.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: >100 ppm/48 h/shrimp/LC_{50}/saltwater; Aquatic toxicity rating = 100 to 1 000/96 h/TLm/freshwater; >5 000 mg/L/24 h/goldfish/LD_{50}/freshwater; 41 000 mg/L/96 h/rainbow trout/LC_{50}/freshwater; BOD: 16 to 68%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from spill site. Dike to prevent runoff. Notify manufacturer for advice. Notify environmental authorities.

Protective Clothing and Equipment

Protective outer clothing as required.

Fire and Explosion

Use water fog, alcohol foam, carbon dioxide or dry chemical to extinguish. Water or foam may cause frothing.

First Aid

Move victim out of from spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and wash affected areas with plenty of water; eyes - irrigate with water. Ingestion: give water to conscious victim to drink and induce vomiting. If medical assistance is not immediately available, transport victim to doctor, clinic or hospital.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Adsorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

ETHYLENEIMINE CH_2CH_2NH

IDENTIFICATION

UN No. 1185

Common Synonyms	Observable Characteristics	Manufacturers
ETHYLENEIMINE (inhibited) AZIRIDINE DIMETHYLENIMINE AZACYCLOPROPANE DIHYDROAZIRINE	Colourless, oily liquid. Ammoniacal odour.	No Canadian or U.S. Manufacturers: Imported from Nippon Shokubai, Japan

Transportation and Storage Information

Shipping State: Liquid. **Classification:** Flammable liquid, poison. **Inert Atmosphere:** Inerted. **Venting:** Safety relief. **Pump Type:** Centrifugal or positive displacement; stainless steel.	**Label(s):** Red label - FLAMMABLE LIQUID; Class 3.2, Group I. White label - POISON; Class 6.1, Group I. **Storage Temperature:** Ambient. **Hose Type:** Flexible, stainless steel.	**Grades or Purity:** 99.0%. **Containers and Materials:** Drums (plastic-lined), tank cars (with inhibitor; NaOH).

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility** (Water): Completely soluble. **Molecular Weight:** 43.1 **Vapour Pressure:** 160 mm Hg (20°C); 250 mm Hg (30°C). **Boiling Point:** 55 to 57°C.	**Floatability** (Water): Floats and mixes. **Odour:** Ammoniacal (1.96 to 2 ppm, odour threshold). **Flash Point:** -4°C (o.c.); -11°C (c.c.). **Vapour Density:** 1.5 **Specific Gravity:** 0.83 (20°C).	**Colour:** Colourless. **Explosive Limits:** 3.6 to 46%. **Melting Point:** -71°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: difficulty breathing, headache, dizziness, coughing, burning of respiratory tract and mucous membranes. Contact: eyes - burns; skin - severe vesicant-desicant can produce third degree burns, readily absorbed, producing symptoms similar to inhalation. Ingestion: nausea, vomiting and burning of mucous membranes.
Toxicology: Highly toxic by ingestion, inhalation or contact.

TLV® - (skin) 0.5 ppm; 1.0 mg/m^3. Short-term Inhalation Limits - No information.	LC_{50} - No information. LC_{Lo} - **Inhalation:** rat = 25 ppm/8 h Delayed Toxicity - Suspected carcinogen.	LD_{50} - Oral: rat = 0.015 g/kg

Fire

Fire Extinguishing Agents: Use alcohol foam, dry chemical or carbon dioxide. Water may be ineffective, but may be used to cool fire-exposed containers and knock down vapours.
Behaviour in Fire: Containers may rupture when exposed to heat and flame. At high temperatures (in fires), may polymerize with the evolution of heat. Flash-back may occur along vapour trail. Toxic nitric oxide fumes produced by burning.
Ignition Temperature: 320°C. **Burning Rate:** No information.

Reactivity

With Water: Mild reaction; soluble.
With Common Materials: In the presence of acidic type materials catalytically active metals or chloride ions, a violent exothermic reaction can occur. Reacts violently with acetic acid, acetic anhydride, acrolein, acrylic acid, allyl chloride, carbon disulfide, chlorine, chlorosulfonic acid, epichlorohydrin, hydrochloric acid, hydrofluoric acid, nitric acid, oleum, silver, sodium hypochlorite, sulfuric acid and vinyl acetate.
Stability: Unstable. May polymerize violently.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: No information; BOD: No information.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE. POISON. UNSTABLE. CORROSIVE.

Immediate Responses

Keep non-involved people away from spill site. Issue warnings: "FLAMMABLE; POISON". Call Fire Department. Eliminate all sources of ignition. Call supplier or manufacturer. Avoid contact and inhalation. If material is burning, work from upwind. If water spray is used, dike area to contain toxic runoff. Stop or reduce discharge, if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Boots - rubber (pants worn outside boots). Gloves - rubber.

Fire and Explosion

Use dry chemical, alcohol foam or carbon dioxide to extinguish. Water may be ineffective on fire, but may be used to cool fire-exposed containers. Fight fires from behind barrier. Flashback may occur along vapour trail. Toxic nitric oxide fumes produced by burning.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: eyes - immediate and continuous irrigation with flowing water; skin - remove contaminated clothing and flush affected areas with plenty of water. Ingestion: do not induce vomiting; give large quantities of milk or water to conscious victim to drink. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so. Caution: highly toxic; use non-sparking tools.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Adsorb residual liquid on natural or synthetic sorbents.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

ETHYLENE OXIDE CH_2CH_2O

IDENTIFICATION

UN No. 1040

Common Synonyms	Observable Characteristics	Manufacturers
OXIRANE 1,2-EPOXYETHANE OXANE DIMETHYLENE OXIDE	Colourless gas or liquid at room temperature. Ethereal odour.	Union Carbide Canada Ltd., Montreal, Quebec (sold in cylinders by Matheson). Dow Chemical Canada Inc., Sarnia, Ontario, Fort Saskatchewan, Alta.

Transportation and Storage Information

Shipping State: Liquid (compressed gas).
Classification: Poisonous gas and flammable gas.
Inert Atmosphere: Inerted, with nitrogen.
Venting: Safety relief.
Pump Type: Centrifugal (not gear), explosion-proof.

Label(s): Red label - FLAMMABLE GAS; Class 2.1.
White label - POISON; Class 2.3.
Storage Temperature: Ambient or refrigerated.
Hose Type: Carbon steel, flexible stainless steel, no natural rubber.

Grades or Purity: Technical, pure (99.7%).
Containers and Materials: Cylinders, tank cars; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas.
Solubility (Water): Completely miscible.
Molecular Weight: 44.1
Vapour Pressure: 1 095 mm Hg (20°C); 1 596 mm Hg (30°C).
Boiling Point: 10.6°C.

Floatability (Water): Floats and mixes.
Odour: Ethereal (0.8 to 500 ppm, odour threshold).
Flash Point: <-18°C (c.c.); -29°C (o.c.).
Vapour Density: 1.5
Specific Gravity: 0.89 (7°C).

Colour: Colourless.
Explosive Limits: 3.6 to 100.0% (under certain conditions as low as 29%).
Melting Point: -111°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: nose and throat irritation; nausea, vomiting, abdominal pain, difficulty breathing, coughing, dizziness. Contact: skin - burns, blistering, frostbite; eyes - burns. Ingestion: sore throat, nausea, vomiting, diarrhea, convulsions.
Toxicology: Highly toxic by ingestion and moderately toxic by inhalation.
TLV* - (inhalation) 1 ppm; 20 mg/m^3.
Short-term Inhalation Limits - No information.

LC_{50} - Inhalation: rat = 1 462 ppm/4 h
TC_{Lo} - Inhalation: human 12,500 ppm/10 sec.
Delayed Toxicity - Suspected carcinogen.

LD_{50} - Oral: rat = 0.072 g/kg

Fire

Fire Extinguishing Agents: Use alcohol foam, carbon dioxide or dry chemical. Water may be ineffective because only dilution with 23 volumes of water renders ethylene oxide nonflammable. Water may be used to cool fire-exposed containers.
Behaviour in Fire: Flashback may occur along vapour trail. Can burn inside enclosures with no oxygen.
Ignition Temperature: 429°C.
Burning Rate: 3.5 mm/min.

Reactivity

With Water: Reacts exothermically unless large dilution achieved.
With Common Materials: May polymerize violently with evolution of heat on contact with anhydrous chlorides of iron, tin and aluminum, oxides of iron and aluminum and alkali metal hydroxides. Can react with acids, bases, alcohols, ammonia, copper, magnesium perchlorate and potassium.
Stability: Stable, within the limits of the foregoing.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating = 10 to 100 ppm/96 h/TLm/freshwater; 90 mg/L/24 h/goldfish/LD_{50}/freshwater; BOD: 6%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE; POISON. May polymerize violently.

Immediate Responses

Keep non-involved people away from spill site. Issue warnings: "FLAMMABLE; POISON". Call Fire Department. Evacuate from downwind. Eliminate all sources of ignition. Avoid contact and inhalation. Work from upwind and use water spray to control vapour. Stop or reduce discharge, if this can be done without risk. If material is leaking from container, it will inevitably catch fire. Due to the material's ability to burn within vessel with no oxygen, depressurization should be attempted. The best method is to displace ethylene oxide through the leak with water. Contact manufacturer or supplier for assistance. Dike to prevent runoff from rainwater or water application. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and full protective clothing. Gloves - rubber or plastic. Acid suit - jacket and pants, rubber or plastic. Boots - high, rubber (pants worn outside boots). Leather should not be used.

Fire and Explosion

Use dry chemical, alcohol, foam or carbon dioxide to extinguish. Water may be ineffective, but may be used to cool fire-exposed containers and to protect men effecting shutoff. Flashback may occur along vapour trail and into vessels if pressure reduced.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if breathing has stopped; give oxygen if breathing is laboured. Contact: remove contaminated clothing and immediately flush eyes and skin with plenty of warm water. Ingestion: give milk or water to conscious victim and induce vomiting. Keep victim warm and quiet. If medical assistance is not immediately available, transport victim to hospital, clinic or doctor.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Contact manufacturer or supplier for advice.
2. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Contact manufacturer or supplier for advice.
2. Dike to prevent runoff from rainwater or water application.
3. If liquid, remove material with nitrogen displacement and place in appropriate containers.
4. Recover undamaged containers.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

2-ETHYLHEXANOL $CH_3(CH_2)_3CH(C_2H_5)CH_2OH$

IDENTIFICATION

UN No. 2282 - hexanols

Common Synonyms	Observable Characteristics	Manufacturers
2-ETHYLHEXYL ALCOHOL OCTYL ALCOHOL 2-ETHYL-1-HEXANOL	Colourless liquid. Unpleasant, musty odour.	BASF Canada Limited, Montreal, Quebec.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Not regulated.
Inert Atmosphere: No requirement.
Venting: Open (flame arrester).
Pump Type: Standard, flammable liquid types.

Label(s): None required.
Storage Temperature: Ambient.
Hose Type: Natural rubber, polyethylene, butyl.

Grades or Purity: Technical, 99 to 99.7%.
Containers and Materials: Cans, drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 0.1 g/100 mL (20°C).
Molecular Weight: 130.2
Vapour Pressure: 0.36 mm Hg (20°C); 1.0 mm Hg (33°C).
Boiling Point: 179 to 185°C.

Floatability (Water): Floats.
Odour: Unpleasant, musty (0.08 to 0.14 ppm, odour threshold).
Flash Point: 85°C (o.c.); 73°C (c.c.).
Vapour Density: 4.5
Specific Gravity: 0.83 (20°C).

Colour: Colourless.
Explosive Limits: 0.88 to 9.7%.
Melting Point: -76°C.

HAZARD DATA

Human Health

Symptoms: Inhalation and ingestion: nausea, vomiting, headache, dizziness; Contact: skin and eyes - mildly irritating.
Toxicology: Moderately toxic by ingestion and skin contact.
TLV® No information.
Short-term Inhalation Limits - No information.

LC_{50} - No information.
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 3.2 g/kg

Fire

Fire Extinguishing Agents: Use foam, carbon dioxide or dry chemical. Water may be ineffective.
Behaviour in Fire: No information.
Ignition Temperature: 231°C.

Burning Rate: 4 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Can react with oxidizing materials.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 19 ppm/24 h/brine shrimp/TLm/saltwater; BOD: 88%, 5 days (theoretical).
Land-Air: No information.
Food Chain Concentration Potential None.

EMERGENCY MEASURES

Special Hazards

COMBUSTIBLE.

Immediate Responses

Keep non-involved people away from spill site. Call Fire Department. Avoid contact. Stop discharge if safe to do so. Notify manufacturer. Notify environmental authorities.

Protective Clothing and Equipment

In fires, Respiratory protection - use self-contained breathing apparatus. Goggles - (mono), tight-fitting. Face shield may be worn, but must not replace goggles. Gloves - rubber or plastic. Coveralls or acid suit (jacket and pants).

Fire and Explosion

Use dry chemical, alcohol foam or carbon dioxide to extinguish fire. Water may be ineffective on fire, but may be used to cool fire-exposed containers.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Contact: remove contaminated clothing and wash eyes and affected skin thoroughly with warm water. Ingestion: give milk or water to conscious victim to drink. Keep victim warm and quiet. If medical assistance is not immediately available, transport victim to hospital, clinic or doctor.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

FENITROTHION $C_9H_{12}NO_5PS$

IDENTIFICATION

UN No. 2783
Danger Group According to Percentage of Active Substance: Group III, Solid 45 to 100%
Liquid 10 to 100%

Common Synonyms

O,O-DIMETHYL O-4-NITRO-M-TOLYL PHOSPHOROTHIOATE

Common Trade Names
FOLITHION, SUMITHION, NOVATHION

(An insecticide used largely in Canada for spruce budworm control).

Observable Characteristics

Yellowish to yellowish-brown liquid or solid.
Slight odour.

Manufacturers

Sumitomo Shoji Canada Ltd., Toronto, Ontario.
Chemagro Ltd., Mississauga, Ontario.

Transportation and Storage Information

Shipping State: Solid or liquid (formulation).
Classification: None.
Inert Atmosphere: No requirement.
Venting: Open.
Pump Type: No information.

Label(s): Not regulated.
Storage Temperature: Ambient.
Hose Type: No information.

Grades or Purity: Various as described below.
Containers and Materials: Cans, drums; aluminum stainless steel, lined steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid (technical).
Solubility (Water): Insoluble (technical) EC and WP are dispersible.
Molecular Weight: 277.2
Vapour Pressure: 0.000006 mm Hg (20°C).
Boiling Point: 140-145°C (0.1 mm Hg) decomposes.

Floatability (Water): Sinks, EC and WP dispersible in water.
Odour: Slight.
Flash Point: No information.
Vapour Density: No information.
Specific Gravity: 1.32-1.34 (technical).

Colour: Yellow to yellowish-brown.
Explosive Limits: SN may form explosive mixtures in air.
Melting Point: 0.3°C (technical).

HAZARD DATA

Human Health

Symptoms: Inhalation, Ingestion or Contact (skin): readily absorbed through skin; nausea, salivation, tearing, abdominal cramps, vomiting, sweating, slow pulse, muscular tremors.
Toxicology: Highly toxic by ingestion and skin contact.
TLV* - No information.
Short-term Inhalation Limits - No information.
LC_{50} - No information.
Delayed Toxicity - No information.
LD_{50} - Oral: rat = 0.25 g/kg
LD_{50} - Oral: cat = 0.14 g/kg

Fire

Fire Extinguishing Agents: Foam, carbon dioxide or dry chemical.
Behaviour in Fire: Releases toxic fumes.
Ignition Temperature: No information.
Burning Rate: No information.

Reactivity

With Water: No reaction.
With Common Materials: No information.
Stability: Stable.

Environment

Water: Prevent entry into water intakes or waterways.
Land-Air: LD_{50} - Oral: Wild bird = 0.025 g/kg; chicken = 0.28 g/kg; duck = 1.19 g/kg.
Food Chain Concentration Potential: Decomposes in tissue to other compounds (Desmethylsumithion and dimethylphosphorothioic acid).

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Stop or reduce discharge if safe to do so. Notify manufacturer or supplier. Dike to contain material or water runoff. Notify environmental authorities.

Protective Clothing and Equipment

In fires or confined spaces - Respiratory Protection - self-contained breathing apparatus and totally encapsulated suit. Otherwise, approved pesticide respirator and impervious outer clothing.

Fire and Explosion

Use carbon dioxide, foam or dry chemical to extinguish. Releases toxic fumes in fires.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give water to conscious victim to drink and induce vomiting; in the case of petroleum distillates, do not induce vomiting for fear of aspiration and chemical pneumonia. If medical assistance is not immediately available, transport victim to hospital, doctor, or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water
1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.

Floats
3. If possible contain discharge by booming.
4. If floating, skim and remove.

Sinks or mixes
3. If possible contain discharge by damming or water diversions.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.

5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air
1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. If liquid, remove material with pumps or vacuum equipment and place in appropriate containers.
5. If solid, remove material by manual or mechanical means.
6. Recover undamaged containers.
7. Absorb residual liquid on natural or synthetic sorbents.
8. Remove contaminated soil for disposal.
9. Notify environmental authorities to discuss cleanup and disposal of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

Available Formulations

Technical Grade: Purity: 95%+.
Properties: insoluble liquid, sinks in water.

Formulations:

Type:	Purity:	Properties:
EC - emulsifiable concentrate	- 80%	- dispersible in water
LI - liquid	- 95 +%	- insoluble in water.
SN - solution	- typically 96% in organic solvents.	- combustible.
WP - wettable powder	- 40%	- low combustibility.

FERRIC CHLORIDE $FeCl_3$

IDENTIFICATION

UN No. Solid 1173
Solution 2583

Common Synonyms	Observable Characteristics	Manufacturers
IRON CHLORIDE FERRIC TRICHLORIDE FERRIC PERCHLORIDE IRON TRICHLORIDE IRON PERCHLORIDE IRON (III) CHLORIDE	Brown to black solid or dark reddish-brown liquid (solution). Odourless or slight acidic odour.	No Canadian Manufacturers Canadian Supplier: Diversey Canada Limited, Mississauga, Ontario.

Transportation and Storage Information

Shipping State: Liquid (39% solution); solid (96%). **Classification:** Corrosive. **Inert Atmosphere:** No requirement. **Venting:** Open. **Pump Type:** Gear, centrifugal; rubber-lined, plastic-lined.	**Label(s):** Black and white label - CORROSIVE SOLID; Class 8, Group II; SOLUTION; Class 5, Group III. **Storage Temperature:** Ambient. **Hose Type:** Natural rubber, polyethylene, polypropylene, PVC.	**Grades or Purity:** Solution (42° Bé; 39%); solid, anhydrous, 96%. **Containers and Materials:** Solution - drums, tank cars, tank trucks. Anhydrous (solid) - drums.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid. **Solubility** (Water): 74.4 g/100 mL (0°C); 535.7 g/100 mL (100°C). **Molecular Weight:** 162.2 **Vapour Pressure:** No information. **Boiling Point:** 315°C (decomposes).	**Floatability** (Water): Sinks and mixes. **Odour:** Odourless or slight acidic odour. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** 2.9 (anhydrous) (20°C); 1.4 (42° Bé solution).	**Colour:** Anhydrous - brown to black; Solution - dark reddish-brown. **Explosive Limits:** Not flammable. **Melting Point:** Approximately 300°C.

HAZARD DATA

Human Health

Symptoms: Contact: eyes - irritation; skin - irritation, dermatitis, staining and burning. Ingestion: may cause burns of the mucous membranes and severe irritation of the gastrointestinal tract. Inhalation: nose and throat irritation.
Toxicology: Moderately to highly toxic by ingestion. Highly toxic by contact.

TLV® - 1 mg/m^3 (as Fe) Short-term Inhalation Limits - 2 mg/m^3 (as Fe) (15 min).	LC_{50} - No information. Delayed Toxicity - None known.	LD_{50} - Oral: mouse = 1.28 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents, except water, may be used in fires involving ferric chloride.
Behaviour in Fire: When heated to decomposition in fire, it may release fumes of hydrogen chloride.

Ignition Temperature: Not combustible.	**Burning Rate:** Not combustible.

Reactivity

With Water: Reacts exothermically producing corrosive HCl fumes.
With Common Materials: Ferric chloride is a strong oxidizing agent and solutions are very corrosive to iron, copper and most metals. Violent reaction with allyl chloride and sodium and potassium metals.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 4 ppm (as Fe)/24 to 96 h/striped bass larvae/LC_{50}/freshwater; 15 ppm/96 h/Daphnia magna (water flea)/TLm; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "CORROSIVE". Avoid contact and inhalation. Stop or reduce discharge, if this can be done without risk. Contain spill by diking with earth or other available material. Contact manufacturer for advice. Notify environmental authorities.

Protective Clothing and Equipment

Goggles - (mono), tight-fitting. If face shield is used, it must not replace goggles. Gloves - rubber. Boots - high, rubber (pants worn outside boots). Ferric chloride attacks leather boots and shoes rapidly. Outerwear - coveralls, aprons; rubber or vinyl. Respiratory protection required only in the case of fire, where hydrogen chloride may be present.

Fire and Explosion

Not combustible. Most fire extinguishing agents, except water, may be used. When heated to decomposition in fire, fumes of hydrogen chloride may be released.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Contact: eyes - irrigate with plenty of water for at least 15 minutes; skin - remove contaminated clothing and wash affected areas with plenty of water. Ingestion: give conscious victim milk or water to drink. Keep warm and quiet. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

FLUORINE F_2

IDENTIFICATION

UN No. 1045

Common Synonyms	Observable Characteristics	Manufacturers	
None.	Pale yellow compressed gas. Sharp, choking, irritating odour.	No Canadian manufacturers. Canadian suppliers: Air Products, Brampton, Ontario.	Originating from: Air Products and Chemicals Incorporated, Specialty Gas Department, Allentown, PA, USA

Transportation and Storage Information

Shipping State: Liquid (compressed gas).
Classification: Poison, oxidizer.
Inert Atmosphere: No requirement.
Venting: Safety relief.
Pump Type: No information.

Label(s): White label - POISON.
Yellow label - OXIDIZER; Class 2.3, 5.1.
Storage Temperature: Ambient.
Hose Type: No information.

Grades or Purity: >98% F_2.
Containers and Materials: Cylinders, tank trailers; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas.
Solubility (Water): Reacts to form HF.
Molecular Weight: 38.0
Vapour Pressure: 18 100 mm Hg (0°C); 31 300 mm Hg (20°C).
Boiling Point: -188°C.

Floatability (Water): Liquefied fluorine sinks; liquid and gas react to form HF.
Odour: Sharp, choking, irritating; (0.035 ppm, odour threshold).
Flash Point: Not flammable.
Vapour Density: 1.3

Colour: Pale yellow.
Explosive Limits: Not flammable.
Melting Point: -219.6°C.
Specific Gravity: (liquid) 1.5 (-188°C).

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation and ulceration of mucous membranes, coughing fits, difficulty breathing, respiratory damage, coma, death. Ingestion: painful burning, ulceration of mucous membranes, intense thirst, difficulty breathing, coughing, nausea and vomiting, convulsions, coma, death. Contact: skin - burning, blisters, profound tissue damage; eyes - burning, irreparable corneal damage, loss of vision.
Toxicology: Highly toxic by inhalation, ingestion and contact.

TLV® (inhalation) 1 ppm; 2 mg/m^3.
Short-term Inhalation Limits - 2 ppm; 4 mg/m^3 (15 min).

LC_{50} - Inhalation: rat = 185 ppm/1 h
LC_{50} - Inhalation: mouse = 150 ppm/1 h
Delayed Toxicity - No information.

LD_{50} - No information.

Fire

Fire Extinguishing Agents: Once a fire has started with fluorine as the oxidizer, there is no effective way of stopping it other than shutting off the source of fluorine. Clear the area and allow the fire to burn until all of the fluorine is consumed. Do not attempt to extinguish the fire with water or chemicals, since these would act as additional fuel.
Behaviour in Fire: Fluorine acts exothermically with most materials.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: Reacts exothermically to produce HF and oxygen.
With Common Materials: Reacts violently with many materials; such as most organic matter, hydrogen-containing molecules, oxides of sulfur, nitrogen, phosphorous halides, alkaline metals and alkaline earths. Reacts violently with metals and their sulfides, phosphides, oxides, hydrides, acetylides and carbides. Reacts violently with other halogens and halogen acids, phosphorus, sulfur, hydrazine, coke, potassium nitrate, carbon tetrachloride, silicates, alkenes, alkylbenzenes, carbon disulfide, aluminum, manufactured gas and many polymers.
Stability: Stable only under normal circumstances, reacts with many materials.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life in very low concentrations. Fish toxicity: 2.3 ppm/tns/trout/TLm/fresh-water; BOD: No information.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

POISON. OXIDIZER. CORROSIVE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "POISON and OXIDIZER". Call Fire Department (note caution re: use of water). Consider evacuation of downwind area. Contact manufacturer or supplier immediately for guidance and assistance. Control of discharge should be attempted only by experienced persons. Work from upwind. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Gloves - leather. Boots - high rubber.

Fire and Explosion

Water should be used only to cool containers exposed to fire. Do NOT attempt to extinguish fire with water or chemicals.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: If breathing has stopped or is laboured, give artificial respiration (not mouth-to-mouth method). Supplemental oxygen should be given also. Contact: eyes - irrigate with plenty of water; skin - flush affected areas with plenty of water and remove contaminated clothing immediately. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water
1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air
1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Recover undamaged containers.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

FLUOROCHLOROMETHANES

IDENTIFICATION

UN No. 1028 dichlorodifluoromethane
1018 chlorodifluoromethane
1022 chlorotrifluoromethane

Common Synonyms
11; CCl_3F - Trichlorofluoromethane (Freon 11)
12; Cl_2F_2C - Dichlorodifluoromethane (Freon 12; Halon 12)
13; ClF_3C - Chlorotrifluoromethane (Freon 13)
21; Cl_2FCH - Dichlorofluoromethane (Freon 21)
22; ClF_2CH - Chlorodifluoromethane (Freon 22)

Observable Characteristics
Colourless, practically odourless gases.

Manufacturers
Du Pont Canada, Maitland, Ont.
Allied Chemical, Amherstburg, Ont.

Transportation and Storage Information

Shipping State: Liquefied (compressed gases).
Classification: Non-flammable gases.
Inert Atmosphere: No requirement.
Venting: Safety-relief.

Label(s): Green and white label - NON-FLAMMABLE GAS; Class 2.2.
Storage Temperature: Ambient.
Hose Type: No information.

Pump Type: No information.
Grades or Purity: Technical and refrigerant.
Containers and Materials: Cylinders; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas.
Solubility (Water): (11) 0.11 g/100 mL (25°C); (12) 0.028 g/100 mL (25°C); (13) 0.009 g/100 mL (25°C); (21) 0.95 g/100 mL (20°C); (22) 0.30 g/100 mL (25°C).
Molecular Weight: (11) 137.4; (12) 120.9; (13) 104.5; (21) 102.9; (22) 86.5.
Vapour Pressure: (11) 687 mm Hg; (12) 4 250 mm Hg; (13) 2 400 mm Hg; (21) 1 216 mm Hg; (22) 6 800 mm Hg (all at 20°C).

Boiling Point: (11) 23.8°C; (12) -29.8°C; (13) -81.4°C; (21) 8.9°C; (22) -40.7°C.
Floatability (Water): Sink and boil.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: (11) No information; (12) 4.2; (13) 3.6; (21) 3.6; (22) 3.1.
Specific Gravity: (11) 1.49 (0°C); (12) 1.33 (20°C) liquid; (13) 1.35 (-40°C) liquid; (21) 1.42 (0°C); (22) 1.4 (-40.7°C) liquid.

Colour: Colourless.
Explosive Limits: Not flammable.
Melting Point: (11) -111.1°C; (12) -158.0°C; (13) -181.0°C; (21) -135.0°C; (22) -157.4°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: dizziness, loss of coordination, narcosis, asphyxia, nausea, vomiting. Contact: skin - defatting; liquid causes frostbite, irritation and dermatitis.
Toxicology: Low toxicity by inhalation and contact.
*TLV** - (11) 1 000 ppm; 5 600 mg/m^3; (12) 1 000 ppm; 4 950 mg/m^3; (21) 10 ppm; 40 mg/m^3; (22) 1 000 ppm; 3 500 mg/m^3.

LC_{50} - (11) Inhalation: mouse = 10 000 ppm/30 min
LC_{50} - (12) Inhalation: rat = 80 000 ppm/30 min
Delayed Toxicity - No information.

LD_{50} - (11) Intraperitoneal: mouse = 1.74 g/kg
Short-term Inhalation Limits - (12) 1 250 ppm; 6 200 mg/m^3; (22) 1 250 ppm; 4 375 mg/m^3 15 min).

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used in fires involving fluorochloromethanes.
Behaviour in Fire: Toxic by-products are formed on heating to decomposition; highly toxic chlorides and fluorides.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: No reaction.
With Common Materials: (12) (13) react with aluminum.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating (12) and (22): >1 000 ppm/96 h/TLm/freshwater; BOD: No information.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from spill site. If involved in fire, evacuate downwind. Notify manufacturer or supplier. Notify environmental authorities.

Protective Clothing and Equipment

In fires or confined spaces Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Otherwise, protective clothing as required.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used on fires involving fluorochloromethanes. Toxic by-products are formed on heating to decomposition, highly toxic chlorides and fluorides.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if breathing has stopped; give oxygen if breathing is laboured. Contact: skin - remove contaminated clothing, flush affected areas with plenty of water and treat as for frostbite; eyes - irrigate with plenty of water. If medical assistance is not immediately available, transport victim to doctor, clinic or hospital.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Remove material by manual or mechanical means.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

FLUOSILICIC ACID $H_2SiF_6 \cdot xH_2O$

IDENTIFICATION

UN No. 1778

Common Synonyms	Observable Characteristics	Manufacturers
HYDROFLUOSILICIC ACID HEXAFLUOROSILICIC ACID SILICOFLUORIC ACID HYDROSILICOFLUORIC ACID SAND ACID	Colourless to white liquid. Sharp, acidic odour.	Canadian Industries Ltd., Courtright, Ontario. Cominco Ltd., Trail, B.C. International Minerals and Chemicals, Corporation (Canada) Ltd., Port Maitland, Ontario.

Transportation and Storage Information

Shipping State: Liquid. **Classification:** Corrosive liquid. **Inert Atmosphere:** No requirement. **Venting:** Open. **Pump Type:** Centrifugal; rubber-lined, without packing, PVC, propylene or hard rubber.	**Label(s):** Black and white label - CORROSIVE LIQUID; Class 8, Group II. **Storage Temperature:** Ambient. **Hose Type:** Natural rubber, Hysunite, Hypalon.	**Grades or Purity:** 22 to 30% solutions in water. **Containers and Materials:** Drums, tank cars, tank trucks; steel, rubber or plastic-lined.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility** (Water): Soluble in all proportions. **Molecular Weight:** 144 (for solute only). **Vapour Pressure:** No information. **Boiling Point:** 100 to 105°C (decomposes).	**Floatability** (Water): Sinks and mixes. **Odour:** Sharp, acidic. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** 1.2 to 1.3 (20°C).	**Colour:** Colourless. **Explosive Limits:** Not flammable. **Melting Point:** -31 to -20°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of mucous membranes, watering of eyes, salivation, coughing fits, ulceration of mucous membranes (nose and throat), difficulty breathing, headache, nausea, coma. Contact: skin - burning, blistering, and profound damage to tissues; eyes - watering, burning, irreparable damage. Ingestion: irritation and painful burning of lips, mouth and throat, ulceration of mucous membranes, pain in swallowing, intense thirst, painful stomach cramps and distension of stomach, difficulty breathing, coughing, nausea and vomiting, convulsions, coma.
Toxicology: Highly toxic by inhalation, ingestion and contact.

TLV® (inhalation) 1 ppm; 2 mg/m^3 (as F). Short-term Inhalation Limits - 2 ppm; 4 mg/m^3 (15 min) (as F).	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - No information. LD_{Lo} - Oral: guinea pig = 0.2 g/kg

Fire

Fire Extinguishing Agents: Not combustible; most fire extinguishing agents may be used on fires involving fluosilicic acid, except water.
Behaviour in Fire: If decomposing (boiling), as in fire, corrosive and irritating HF fumes are liberated.

Ignition Temperature: Not combustible.	**Burning Rate:** Not combustible.

Reactivity

With Water: Soluble, with evolution of heat and toxic HF fumes.
With Common Materials: Vigorously attacks most common metals, including steel, with evolution of hydrogen gas. May react with aluminum, alkalis, cyanides and magnesium.
Stability: Decomposes with heat (evolution of HF).

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "CORROSIVE". Contact supplier or manufacturer for advice. Contain spill by diking to prevent runoff. Avoid contact and inhalation of fumes. Stop or reduce discharge, if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and full protective clothing. Gloves - (gauntlet) rubber or neoprene. Boots - high, rubber (pants worn outside boots). Outerwear - acid-resistant aprons or suits.

Fire and Explosion

Not combustible; most fire extinguishing agents may be used on fires involving fluosilicic acid, except water.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: If breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: eyes - irrigate with plenty of water for at least 15 minutes; skin - flush with plenty of water and remove contaminated clothing. Ingestion: give conscious victim milk or water to drink. Do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Neutralize soil and contaminated waters with sodium bicarbonate.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

FORMALDEHYDE HCHO (aqueous)

IDENTIFICATION

UN No. 1198
2209

Common Synonyms	Observable Characteristics	Manufacturers
FORMALITH, FORMALIN FORMALDEHYDE SOLUTION FORMIC ALDEHYDE METHANAL, METHYLENE OXIDE OXOMETHANE	Clear, colourless liquid. Pungent, irritating odour.	Celanese Canada Ltd., Edmonton, Alberta. Reichhold Chemicals Ltd., North Bay, Ont., Thunder Bay, Ontario. Bakelite Thermosets Ltd., Belleville, Ont.

Transportation and Storage Information

Shipping State: Liquid (aqueous solution). **Classification:** Not regulated. **Inert Atmosphere:** No requirement. **Venting:** Pressure-vacuum. **Pump Type:** Centrifugal; stainless steel.	**Label(s):** None. Class 9.1, Group III. **Storage Temperature:** Ambient. **Hose Type:** Polyethylene, butyl, Hypalon, Viton, natural rubber.	**Grades or Purity:** Pure formaldehyde is not available commercially, because of its tendency to polymerize. It is sold as aqueous solutions containing 37 to 50% formaldehyde by weight and 0 to 15% methanol. **Containers and Materials:** Drums, tank cars, tank trucks; stainless steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility** (Water): Soluble in all proportions. **Molecular Weight:** 30.0 (solute only). **Vapour Pressure:** 10 mm Hg (-88°C) (pure); 760 mm Hg (-19.5°C). **Boiling Point:** -20°C (pure); 101°C (37% solution).	**Floatability** (Water): Sinks and mixes. **Odour:** Pungent, irritating (0.8 to 1 ppm, odour threshold). **Flash Point:** 37% (no methanol) 85°C (c.c.). (with 15% methanol) 50°C (c.c.); 50% (1.5% methanol) 68.5°C (c.c.) **Vapour Density:** 1.1 **Specific Gravity:** 37% solution 1.1 (25°C); liquefied pure 1.1 (25°C).	**Colour:** Colourless. **Explosive Limits:** 7 to 73%. **Melting Point:** 37% solution, -15°C; -118°C (pure).

HAZARD DATA

Human Health

Symptoms: Inhalation: vapour very irritating to eyes and respiratory tract, sore throat, coughing, allergenic effects, bronchitis. Contact: eyes - liquid can cause severe burns skin - repeated contact causes a tanning effect and dermatitis. Ingestion: severe irritation of the gastrointestinal tract; nausea, coma, abdominal pain.

Toxicology: Highly toxic by all routes.

TLV* - (inhalation) 1 ppm; 1.5 mg/m^3. Short-term Inhalation Limits - 2 ppm; 3 mg/m^3.	LC_{50} - No information. LC_{Lo} - Inhalation: rat = 250 ppm/4 h Delayed Toxicity - Suspected carcinogen.	LD_{50} - Oral: rat = 0.8 g/kg

Fire

Fire Extinguishing Agents: Use carbon dioxide, alcohol foam, dry chemical or water spray. Water may be used to cool fire-exposed containers and disperse vapours.

Behaviour in Fire: Formaldehyde vapours may be evolved.

Ignition Temperature: 424°C (37% methanol free). **Burning Rate:** No information.

Reactivity

With Water: No reaction.

With Common Materials: Reacts violently with nitrogen dioxide, (perchloric acid and aniline) and performic acid.

Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life in low concentrations. Fish toxicity: 25 ppm/96 h/channel catfish/TLm/freshwater; 15 mg/m^3/24 h/striped bass larvae/LC_{50}/freshwater; 30 to 1 000 ppm/48 h/shrimp/LC_{50}/saltwater; BOD: 33 to 106%; 5 days.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Call Fire Department. Avoid contact and inhalation. Eliminate all ignition sources. Stay upwind and use water spray to control vapours. Stop or reduce discharge, if this can be done without risk. Contact supplier for guidance. Dike or dam spill to prevent runoff. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus. Acid suit - jacket and pants, rubber or plastic, or coveralls. Boots - high, rubber (pants worn outside boots). Gloves - rubber or plastic.

Fire and Explosion

Use water spray, dry chemical, alcohol foam or carbon dioxide. Cool fire-exposed containers with water spray.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if breathing has stopped (not mouth-to-mouth method); give oxygen if breathing is laboured. Contact: remove contaminated clothing. Wash eyes and skin with plenty of warm water for at least 15 minutes. Ingestion: give warm water to conscious victim to drink. Keep warm and quiet. If medical assistance is not immediately available, transport victim to hospital, clinic or doctor.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Adsorb residual liquid on natural or synthetic sorbents.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

FORMIC ACID HCOOH

IDENTIFICATION

UN No. 1779

Common Synonyms	Observable Characteristics	Manufacturers
FORMYLIC ACID HYDROGEN CARBOXYLIC ACID METHANOIC ACID	Colourless fuming liquid. Pungent, penetrating odour.	No Canadian Manufacturers. US Manufacturers: Celanese Chemical Co., New York, NY Du Pont, Wilmington, DC Union Carbide, New York, NY

Transportation and Storage Information

Shipping State: Liquid. **Classification:** Corrosive. **Inert Atmosphere:** No requirement. **Venting:** Pressure-vacuum. **Pump Type:** No information.	**Label(s):** Black and white label - CORROSIVE. **Storage Temperature:** Ambient. **Hose Type:** No information.	**Grades or Purity:** Technical, 85 to 95%. **Containers and Materials:** Carboys, drums, bulk by tank cars, tank trucks; stainless steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility (Water):** Miscible in all proportions. **Molecular Weight:** 46.0 **Vapour Pressure:** 35 mm Hg (20°C); 54 mm Hg (30°C). **Boiling Point:** 100.8°C.	**Floatability (Water):** Sinks and mixes. **Odour:** Pungent, penetrating (21 ppm, odour threshold). **Flash Point:** 100%, 69°C; 90%, 50°C (c.c.). **Vapour Density:** 1.6 **Specific Gravity:** 1.22 (20°C).	**Colour:** Colourless. **Explosive Limits:** 18 to 57% (90% solution only). **Melting Point:** 8.4°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of respiratory tract, cough, bronchitis, difficulty breathing. Ingestion: nausea, vomiting, dizziness, unconsciousness. Contact: skin - irritation and burns; eyes - irritation and burns.
Toxicology: Moderately toxic by all routes.

TLV® - 5 ppm; 9 mg/m^3.	LC_{50} - No information.	LD_{50} - Oral: rat = 1.21 g/kg
Short-term Inhalation Limits - No information.	Delayed Toxicity - No information.	LD_{50} - Oral: mouse = 1.10 g/kg

Fire

Fire Extinguishing Agents: Use carbon dioxide, dry chemical or alcohol foam. Water may be used to cool fire-exposed containers and disperse vapours.
Behaviour in Fire: No information.
Ignition Temperature: 100%, 539°C; 90%, 434°C. **Burning Rate:** 0.5 mm/min.

Reactivity

With Water: No reaction, soluble.
With Common Materials: Reacts violently with alkalis, furfuryl alcohol and hydrogen peroxide. Reacts with sulfuric acid to produce CO.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 175 mg/L/24 h/bluegill/TLm/freshwater; 120 ppm/48 h/Daphnia magna/TLm/freshwater; 2 500 mg/L/tns/Gammarus pulex/LD_{100}/freshwater; BOD: 2 to 27%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE. FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "CORROSIVE". Call Fire Department. Avoid contact and inhalation. Eliminate all sources of ignition. Call manufacturer or supplier for advice. Dike to contain material. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit.

Fire and Explosion

Use carbon dioxide, dry chemical or alcohol foam to extinguish. Water may be used to cool fire-exposed containers and disperse vapours.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with water. Ingestion: give water to conscious victim to drink; do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment in appropriate containers.
5. Recover undamaged containers.
6. Adsorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

FURFURAL $OC_3H_3C\,CHO$

IDENTIFICATION

UN No. 1199

Common Synonyms	Observable Characteristics	Manufacturers	
FURAL FURFURALDEHYDE 2-FURALDEHYDE 2-FURAN CARBONAL ANT OIL BRAN OIL PYROMUCIC ALDEHYDE	Colourless to yellow to reddish-brown, liquid. Almond-like odour.	No Canadian manufacturers. Canadian supplier: The Quaker Oats Co. of Canada Ltd., Peterborough, Ont.	Originating from: The Quaker Oats Company, Chicago, Ill.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Combustible liquid.
Inert Atmosphere: No requirement.
Venting: Pressure-vacuum.
Pump Type: Gear, centrifugal. Steel, stainless steel.

Label(s): Red and white label - COMBUSTIBLE LIQUID; Class 3.3, Group II.
Storage Temperature: Ambient.
Hose Type: Butyl, polyethylene, polypropylene.

Grades or Purity: Technical, refined.
Containers and Materials: Drums, tank cars, tank trucks; steel, stainless steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 8.3 g/100 mL (20°C); 19.9 g/100 mL (90°C).
Molecular Weight: 96.1
Vapour Pressure: 1 mm Hg (20°C); 3 mm Hg (30°C); 10 mm Hg (50°C).
Boiling Point: 161.7°C.

Floatability (Water): Sinks.
Odour: Almond-like (0.25 ppm odour threshold).
Flash Point: 60°C (c.c.); 67°C (o.c.)
Vapour Density: 3.3
Specific Gravity: 1.16 (20°C).

Colour: Colourless to yellow (pure) will darken to reddish-brown on exposure to light.
Explosive Limits: 2.1 to 19.3%.
Melting Point: -36.5°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of throat, respiratory system, headache, lung congestion. Contact: skin - absorbed readily, dermatitis and eczema; eyes - irritation. Ingestion: sore throat, abdominal pain, vomiting, diarrhea.
Toxicology: Moderately toxic by inhalation, ingestion and skin contact.
TLV® (skin) 2 ppm; 8 mg/m^3.
Short-term Inhalation Limits - 10 ppm; 40 mg/m^3 (15 min).

LC_{50} - No information.
LC_{Lo} - Inhalation: rat = 153 ppm/4 h
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 0.127 g/kg

Fire

Fire Extinguishing Agents: Water spray, carbon dioxide, dry chemical, or alcohol foam. Water may be used to cool fire-exposed containers and disperse vapours.
Behaviour in Fire: No information.
Ignition Temperature: 316°C.

Burning Rate: 2.6 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Reacts explosively with mineral acids or alkalis.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life in low concentrations. Fish toxicity: 24 ppm/96 h/bluegill/TLm/freshwater; 1.2 to 32 mg/L/24 h/bluegill/TLm/freshwater; 24 to 44 mg/L/24 to 96 h/mosquito fish/TLm/freshwater; BOD: 28 to 77%; 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

COMBUSTIBLE. VIOLENT REACTION WITH ACIDS AND ALKALIS.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "COMBUSTIBLE". Call Fire Department. Avoid contact and inhalation. Contain spill by diking. Stop or reduce discharge, if this can be done without risk. Notify manufacturer or supplier. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Gloves - rubber. Boots - high, rubber (pants worn outside boots).

Fire and Explosion

Moderate fire and explosion hazard when exposed to heat and flame. Use water spray, carbon dioxide, dry chemical or alcohol foam to extinguish. Water may be used to cool fire-exposed containers and disperse vapours.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: remove contaminated clothing immediately; flush eyes and affected skin with plenty of warm water. Ingestion: give water or milk to conscious victim to drink and induce vomiting. Keep warm and quiet. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

GASOLINE

IDENTIFICATION

UN No. 1203

Common Synonyms	Observable Characteristics	Manufacturers
PETROL, AUTOMOTIVE FUEL AV-GAS - leaded contains tetraethyl lead - lead-free may contain other compounds.	Colourless (or dyed red, purple) liquid. Typical gasoline odour.	Universally available.

Transportation and Storage Information

Shipping State: Liquid. **Classification:** Flammable liquid. **Inert Atmosphere:** No requirement. **Venting:** Open (flame arrester) or pressure-vacuum. **Pump Type:** Standard.	**Label(s):** Red and white label - FLAMMABLE LIQUID; Class 3.2, Group II. **Storage Temperature:** Ambient. **Hose Type:** Standard.	**Grades or Purity:** Various octane ratings or use ratings. Leaded or lead-free. **Containers and Materials:** Cans, drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility (Water):** 1 to 100 ppm/100 mL water. **Molecular Weight:** Mixture of materials. **Vapour Pressure:** 300 to 600 mm Hg (20°C). **Boiling Point:** 40 to 200°C.	**Floatability (Water):** Floats. **Odour:** Gasoline (0.25 ppm, odour threshold). **Flash Point:** -43°C (c.c.) (up to 60 octane); -38°C (c.c.) up to 100 octane; -46°C (c.c.) aviation. **Vapour Density:** 3 to 4 **Specific Gravity:** 0.75 to 0.85 at 20°C.	**Colour:** Colourless to (dyed red or purple). **Explosive Limits** 1.4 to 7.6%. **Melting Point:** -90 to -75°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: vapours cause rapid breathing, excitability, staggering, headache, fatigue, nausea and vomiting, dizziness, drowsiness, narcosis, convulsions, coma. Ingestion: gastrointestinal irritation, dizziness, fatigue, loss of consciousness, coma. Contact: skin - dryness, cracking, irritation; eyes - watering, stinging and inflammation.
Toxicology: Moderately toxic by inhalation.

TLV® - 300 ppm; 900 mg/m^3. Short-term Inhalation Limits - 500 ppm; 1 500 mg/m^3 (15 min).	LC_{50} - No information. LC_{Lo} - Inhalation: man = 900 ppm/1 h Delayed Toxicity - No information.	LD_{50} - No information.

Fire

Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical. Water may be ineffective and cause fire to spread, but may be used to cool fire-exposed containers.
Behaviour in Fire: Flashback may occur along vapour trail.
Ignition Temperature: 280°C, up to 60 octane; 456°C, up to 100 octane; 440°C, 100 to 130 octane (aviation grade); 471°C, 115 to 145 octane (aviation grade). **Burning Rate:** 4 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Can react vigorously with oxidizing materials.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. Fish toxicity: 90 ppm/24 h/juvenile American shad/TLm/freshwater; 91 mg/L/24 h/juvenile American shad/TLm/saltwater; 5 to 40 ppm/96 h/rainbow trout/TLm/freshwater; BOD: 8%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". Call Fire Department. Eliminate all sources of ignition. Notify manufacturer. Dike to prevent runoff. Shut off leak, if safe to do so. Notify environmental authorities.

Protective Clothing and Equipment

Protective clothing as required.

Fire and Explosion

Use foam, dry chemical or carbon dioxide to extinguish. Water may be ineffective and cause fire to spread, but may be used to cool fire-exposed containers. Flashback may occur along vapour trail.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: If breathing has stopped give artificial respiration; if laboured, give oxygen. Ingestion: give water to conscious victim to drink; do not induce vomiting. Contact: skin - remove contaminated clothing and wash affected areas with plenty of warm water; eyes - irrigate with plenty of water. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Adsorb residual liquid on natural or synthetic sorbents.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

GLYCERINE $CH_2OHCHOHCH_2OH$

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
GLYCEROL GLYCYL ALCOHOL 1,2,3-PROPANETRIOL 1,2,3-TRIHYDROXYPROPANE	Colourless oily liquid. Odourless.	Lever Detergents Ltd., Toronto, Ont. Proctor & Gamble Co. of Canada Ltd., Hamilton, Ont. Colgate-Palmolive Limited, Toronto, Ont. Emery Industries (Canada) Ltd., Toronto, Ont. Dow Chemical Canada - from Dow Chemical, Freeport, TX.

Transportation and Storage Information

Shipping State: Liquid. **Classification:** None. **Inert Atmosphere:** No requirement. **Venting:** Open (flame arrester) or pressure-vacuum. **Pump Type:** Centrifugal, gear; steel or stainless steel.	**Label(s):** Not required. Voluntary label - COMBUSTIBLE LIQUID. **Storage Temperature:** Ambient. **Hose Type:** Polyethylene, Viton, butyl, Hypalon, Teflon, natural rubber.	**Grades or Purity:** CP, 99.5%; USP, 96%. **Containers and Materials:** Drums, tank cars, tank trucks; steel or stainless steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility (Water):** Soluble in all proportions. **Molecular Weight:** 92.1 **Vapour Pressure:** 0.0025 mm Hg (50°C). **Boiling Point:** 290°C.	**Floatability (Water):** Sinks and mixes. **Odour:** Odourless. **Flash Point:** 177°C (o.c.); 160°C (c.c.). **Vapour Density:** 3.2 **Specific Gravity:** 1.26 (20°C).	**Colour:** Colourless. **Explosive Limits:** Not explosive in air. **Melting Point:** 17.9°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of respiratory tract. Ingestion: restlessness, nausea, vomiting, diarrhea, fever. Contact: eyes-irritation.
Toxicology: Moderately toxic by inhalation, ingestion and contact.

TLV® - (inhalation) 10 mg/m^3 (mist).	LC_{50} - No information.	LD_{50} - Oral: rat = 12.6 g/kg
Short-term Inhalation Limits - No information.	**Delayed Toxicity** - No information.	

Fire

Fire Extinguishing Agents: Use alcohol foam, dry chemical or carbon dioxide. Water or foam may cause frothing.
Behaviour in Fire: No information.

Ignition Temperature: 370°C.	**Burning Rate:** 0.9 mm/min.

Reactivity

With Water: No reaction; soluble.
With Common Materials: Can react with powerful oxidizers. Reacts violently with acetic anhydride, calcium hypochlorite, chlorine, chromic anhydride, chromium oxide, potassium permanganate, silver perchlorate and sodium peroxide.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: >5 000 mg/L/24 h/goldfish/LD_{50}/freshwater; Aquatic toxicity rating = >1 000 ppm/96 h/TLm/freshwater; BOD: 61 to 87%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

COMBUSTIBLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "COMBUSTIBLE". Call Fire Department. Stop or reduce discharge, if safe to do so. Contain spill by diking. Notify manufacturer. Notify environmental authorities.

Protective Clothing and Equipment

Goggles - (mono), tight-fitting, and rubber gloves. Protective outerwear as required.

Fire and Explosion

Use alcohol foam, dry chemical or carbon dioxide. Water or foam may cause frothing.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: remove contaminated clothing; wash eyes and skin thoroughly with plenty of water. Ingestion: give water to conscious victim to drink. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for adice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. When liquid, remove material with pumps or vacuum equipment and place in appropriate containers.
5. When solid, remove material by manual or mechanical means.
6. Recover undamaged containers.
7. Adsorb residual liquid on natural or synthetic sorbents.
8. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

n-HEXANE C_6H_{14}

IDENTIFICATION

UN No. 1208

Common Synonyms	Observable Characteristics	Manufacturers
HEXANE	Clear, colourless liquid. Mild, gasoline-like odour.	ESSO Chemicals, Sarnia, Ontario. Texaco Canada, Mississauga, Ontario. Canadian suppliers: Hercules Canada, Varennes, Québec. Polysar, Sarnia, Ontario. Stanchem, Montreal, Québec. Originating from: Phillips Petroleum, USA Union Oil, USA.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable liquid.
Inert Atmosphere: No requirement.
Venting: Open (flame arrester) or pressure-vacuum.
Pump Type: Centrifugal gear; explosion-proof.

Label(s): Red and white label - FLAMMABLE LIQUID; Class 3.1, Group II.
Storage Temperature: Ambient.
Hose Type: Reinforced antistatic rubber, or neoprene.

Grades or Purity: 85, 95 and 99%.
Containers and Materials: Cans, drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 0.00095 g/100 mL (20°C).
Molecular Weight: 86.2
Vapour Pressure: 120 mm Hg (20°C); 190 mm Hg (30°C).
Boiling Point: 68.7 °C.

Floatability (Water): Floats.
Odour: Mild, gasoline-like.
Flash Point: -22°C (c.c.).
Vapour Density: 2.8
Specific Gravity: 0.66 (20°C) (liquid).

Colour: Colourless.
Explosive Limits: 1.1 to 7.5%.
Melting Point: -94 to -96°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of respiratory tract, dizziness, numbness of extremities, intoxication, unconsciousness. Ingestion: irritation of gastrointestinal tract, nausea, vomiting, headache, depression. Contact: skin - defatting and dermatitis; eyes - irritation.
Toxicology: Low toxicity by all routes.
TLV® - 50 ppm; 180 mg/m^3.
Short-term Inhalation Limits - No information.

LC_{50} - No information.
LC_{Lo} - Inhalation: mouse = 120 000 mg/m^3.
Delayed Toxicity - No information.

LD_{50} - No information.
LD_{Lo} - Intraperitoneal: rat = 9.1 g/kg

Fire

Fire Extinguishing Agents: Use dry chemical and carbon dioxide. Water may be ineffective but may be used to cool fire-exposed containers.
Behaviour in Fire: Flashback may occur along vapour trail.
Ignition Temperature: 223°C.
Burning Rate: 7.3 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Can react vigorously with oxidizing materials.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating = >1 000 ppm/96 h/TLm/freshwater; BOD: 221%; 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". Call Fire Department. Eliminate all sources of ignition. Stop or reduce discharge, if safe to do so. Dike to contain the spill. Notify manufacturer. Notify environmental authorities.

Protective Clothing and Equipment

Protective outerwear as required.

Fire and Explosion

Use carbon dioxide or dry chemical to extinguish. Water may be ineffective, but may be used to cool fire-exposed containers.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Ingestion: give water to conscious victim to drink, do not induce vomiting. Contact: skin - remove contaminated clothing and wash affected areas with plenty of water; eyes - irrigate with plenty of water. If medical assistance is not immediately available, transport victim to doctor, hospital or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. If possible, contain discharge by booming.
5. If floating, skim and remove.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

HYDRAZINE N_2H_4

IDENTIFICATION

UN No. 2029 anhydrous
2030 24% solution

Common Synonyms	Observable Characteristics	Manufacturers
DIAMIDE DIAMINE HYDRAZINE, BASE HYDRAZINE, AQUEOUS SOLUTION HYDRAZINE, HYDRATE	Anhydrous - colourless fuming liquid. Hydrates - colourless to yellow liquids. Ammoniacal odour.	

Transportation and Storage Information

Shipping State: Liquid. **Classification:** Corrosive, poison. **Inert Atmosphere:** Padded. **Venting:** Pressure-vacuum. **Pump Type:** No information.	**Label(s):** Black and white label - POISON. **Storage Temperature:** Ambient. **Hose Type:** No information.	**Grades or Purity:** Anhydrous 100%; hydrates 35 to 64% water solutions. **Containers and Materials:** Carboys, drums; steel or aluminum.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm); Liquid. **Solubility (Water):** Soluble in all proportions. **Molecular Weight:** 32.1 **Vapour Pressure:** 16 mm Hg (20°C); 25 mm Hg (30°C). **Boiling Point:** Anhydrous 113.5°C; 24% solution 102°C.	**Floatability (Water):** Floats and mixes (saltwater); sinks and mixes (freshwater). **Odour:** Ammoniacal (3 to 4 ppm, odour threshold. **Flash Point:** 52°C (o.c.); 37.8°C (c.c.) **Vapour Density:** 1.04 to 1.1 **Specific Gravity:** 1.004 (anhydrous) (20°C).	**Colour:** Colourless to yellow. **Explosive Limits:** 2.9 to 98%. **Melting Points:** 1.5°C (anhydrous); -14°C (24% solution).

HAZARD DATA

Human Health

Symptoms: Inhalation: sore throat, coughing, laboured breathing, dizziness. Ingestion: headache, nausea, abdominal pain, diarrhea, dizziness; symptoms similar to inhalation. Contact: skin - redness, pain, absorbed; eyes - temporary blindness, redness and pain.
Toxicology: Highly toxic by all routes.

TLV® (skin) 0.1 ppm; 0.1 mg/m^3. Short-term Inhalation Limits - No information.	LC_{50} - Inhalation: rat = 570 ppm/4 h LC_{50} - Inhalation: mouse = 252 ppm/4 h Delayed Toxicity - Suspected carcinogen.	LD_{50} - Intraperitoneal: rat = 0.76 g/kg LD_{Lo} - Oral: mouse = 0.41 g/kg

Fire

Fire Extinguishing Agents: Use foam, carbon dioxide or dry chemical. Flooding with water may be necessary to prevent reignition. Water may be used to cool fire-exposed containers and knock down vapours.
Behaviour in Fire: Releases toxic NO_x fumes. Can ignite spontaneously in air on contact with porous materials such as earth, asbestos, wood or cloth.
Ignition Temperature: Vary with contact of different materials: iron-rust 23°C, black iron 132°C, stainless steel 156°C; glass 270°C.
Burning Rate: 1 mm/min (est.)

Reactivity

With Water: No reaction; soluble.
With Common Materials: Reacts violently with (alkali metals and ammonia), chlorine, chromates, cupric oxide and salts, fluorine, hydrogen peroxide, metallic oxides, nickel, nitric acid, nitrous oxide, oxygen, potassium dichromate and sodium dichromate.
Stability: May spontaneously ignite under various situations.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 146 ppm/0.5 h/rainbow trout/LD_{100}/freshwater; 136 ppm/22 h/carp/LD_{100}/freshwater.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

CORROSIVE. POISON. Flammable. May spontaneously ignite under certain conditions.

Immediate Responses

Keep non-involved people away from spill site. Issue warnings: "CORROSIVE, POISON". Call Fire Department. Avoid contact and inhalation. Evacuate from downwind. Notify manufacturer or supplier. Dike to contain material. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit.

Fire and Explosion

Use foam, carbon dioxide, or dry chemical to extinguish. Flooding with water may be necessary to prevent reignition. Water may be used to cool fire-exposed containers and knock down vapours. Releases toxic NO_x fumes in fires.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration, (not mouth-to-mouth method) if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with water. Ingestion: give conscious victim water to drink; do not induce vomiting. If medical assistance is not immediately available, transport victim to doctor, hospital or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. With great caution, remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

HYDROCHLORIC ACID HCl (aqueous)

IDENTIFICATION

UN No. 1789

Common Synonyms	Observable Characteristics	Manufacturers
MURIATIC ACID HYDROGEN CHLORIDE (aqueous) CHLOROHYDRIC ACID	Water-white to pale yellow liquid. Sharp, irritating odour. Fumes in humid air.	Canadian Industries Limited, Cornwall, Ont., Becancour, Que. Dow Chemical Canada Inc., Sarnia, Ont., Fort Saskatchewan, Alta. Du Pont Canada Limited, Maitland, Ont. FMC Chemicals, Squamish, B.C. Canadian Occidental, Vancouver, B.C. St. Anne Chemicals, Macawick, N.B.

Transportation and Storage Information

Shipping State: Liquid (aqueous solution).
Classification: Corrosive liquid.
Inert Atmosphere: No requirement.
Venting: Open.
Pump Type: Gear, centrifugal, diaphragm. Rubber or plastic-lined.

Label(s): White and black label - CORROSIVE LIQUID; Class 8, Group II.
Storage Temperature: Ambient.
Hose Type: Natural rubber, polyethylene, polypropylene, PVC, etc.

Grades or Purity: Commercial strengths; 18°Bé (27.9% HCl); 20°Bé (31.5% HCl); 22°Bé (35.2% HCl); 23°Bé (37.1% HCl).
Containers and Materials: Drums, tank cars, tank trucks; steel, rubber-lined.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): Soluble in all proportions.
Molecular Weight: 36.5 (HCl gas).
Vapour Pressure: 25 mm Hg (25°C) (20°Bé);
Boiling Point: 83°C (20°Bé); 62°C (22°Bé); 51°C (23°Bé); 98°C (18°Bé).

Floatability (Water): Sinks and mixes.
Odour: Sharp, irritating (1 to 10 ppm, odour threshold).
Flash Point: Not flammable.
Vapour Density: 1.3
Specific Gravity: 1.14 (18°Bé); 1.16 (20°Bé); 1.18 (22°Bé); 1.19 (23°Bé) (15.5°C).

Colour: Colourless to pale yellow.
Explosive Limits: Not flammable.
Melting Point: -42°C (18°Bé); -53°C (20°Bé); -66°C (22°Bé); -74°C (23°Bé).

HAZARD DATA

Human Health

Symptoms: Inhalation: Vapours can produce severe irritation of the upper respiratory tract, coughing, burning of throat and choking. Contact: eyes - severe irritation of eyes and lids; burning, visual impairment may result; skin - can cause serious burns. Ingestion: very corrosive, can cause serious internal injury. May be fatal.
Toxicology: Moderately toxic by all routes.
TLV® - (inhalation) 5 ppm; 7 mg/m^3.
Short-term Inhalation Limits - No information.

LC_{50} - Inhalation: rat = 3 124 ppm/30 min
Delayed Toxicity - None known.

LD_{50} - Oral: rabbit = 0.9 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used on fires involving hydrochloric acid. Water spray may be used sparingly to knock down vapours.
Behaviour in Fire: When heated, toxic and corrosive hydrogen chloride gas is released.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: Soluble, with evolution of heat.
With Common Materials: Reacts violently with acetic anhydride, ammonium hydroxide, calcium phosphide, chlorosulfonic acid, ethylenediamine, oleum, perchloric acid, propylene oxide, sodium hydroxide, sulfuric acid and vinyl acetate. Reacts with metals forming flammable H_2 gas.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. Fish toxicity: 282 ppm/96 h/mosquito fish/TLm/freshwater; 100 to 300 mg/L/48 h/shrimp/LC_{50}/saltwater; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "CORROSIVE". Contact manufacturer for guidance and assistance. Avoid contact and inhalation. Stop or reduce discharge if this can be done without risk. Contain spill by diking to prevent runoff. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and acid suit (rubber). Gloves - rubber. Boots - high, rubber (pants worn outside boots).

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used on fires involving hydrochloric acid. Water may be used sparingly to knock down vapours.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Contact: immediately irrigate eyes and flush skin with plenty of water for at least 30 minutes while removing contaminated clothing. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Ingestion: if victim is conscious, give as much water or milk as possible to dilute acid. Do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Adsorb residual liquid on natural or synthetic sorbents.
6. Contaminated soil can be treated with lime or soda ash (calcium hydroxide) to render it neutral.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

HYDROFLUORIC ACID HF aqueous

IDENTIFICATION

UN No. 1790

Common Synonyms	Observable Characteristics	Manufacturers
HYDROGEN FLUORIDE (aqueous) FLUORHYDRIC ACID	Clear, colourless liquid. Strong, irritating odour.	Allied Chemical Ltd., Valleyfield, Quebec, Amherstburg, Ontario. Alcan Smelters and Chemicals, Jonquière, Que.

Transportation and Storage Information

Shipping State: Liquid (aqueous solution).
Classification: Corrosive, poison.
Inert Atmosphere: No requirement.
Venting: Pressure-vacuum.
Pump Type: Centrifugal; stainless steel; all propylene.

Label(s): White and black label - CORROSIVE. White label - POISON; Class 8, 2.3.
Storage Temperature: Ambient.
Hose Type: Reinforced Halon TFE or Hypalon.

Grades or Purity: Technical, 48%; CP, 70%.
Containers and Materials: Bottles, drums, tank cars, tank trucks; polylined.

Physical and Chemical Characteristics

Physical state (20°C, 1 atm): Liquid.
Solubility (Water): Soluble in all proportions.
Molecular Weight: 20.0 (for HF gas).
Vapour Pressure: 25 mm Hg (20°C) 48%; 100 mm Hg (15°C), 125 mm Hg (20°C) 70%.
Boiling Point: 67°C (70% solution) 108°C (48% solution); 112°C (38% solution).

Floatability (Water): Sinks and mixes.
Odour: Strong, irritating (5 ppm, odour threshold).
Flash Point: Not flammable.
Vapour Density: 0.7
Specific Gravity: 1.26 (70%); 1.19 (48%) (25°C).

Colour: Colourless.
Explosive Limits: Not flammable.
Melting Point: -37°C (48%); -70°C (70%).

HAZARD DATA

Human Health

Symptoms: Contact: severe burns to skin and eyes. Inhalation: may severely burn respiratory tract, rapid lung inflammation and congestion. Ingestion: severe tissue burns. Can be fatal by all routes.
Toxicology: Highly toxic by all routes.
TLV® - (inhalation) 3 ppm; 2.5 mg/m^3 (as F).
Short-term Inhalation Limits - 6 ppm; 5 mg/m^3 (15 min).

LC_{50} - Inhalation: rat = 1 276 ppm/1 h
Delayed Toxicity - No information.

LD_{50} - No information.
LD_{Lo} - Intraperitoneal: rat = 0.025 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Water may be used on fires involving hydrofluoric acid.
Behaviour in Fire: Not combustible. Toxic and corrosive HF vapours emitted.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: Soluble with evolution of heat.
With Common Materials: Reacts violently with calcium oxide, chlorosulfonic acid with acetic anhydride, ammonium hydroxide, ethylenediamine, fluorine, oleum, propylene oxide, sodium, sodium hydroxide, sulfuric acid and vinyl acetate.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 60 ppm/tns/fish/lethal/freshwater; >300 mg/L as NaF/48 h/brine shrimp/LC_{50}/saltwater; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE. POISON. TOXIC.

Immediate Responses

Keep non-involved people away from spill area. Issue warning: "CORROSIVE, POISON". Contact supplier for advice. Call fire department. Avoid contact and inhalation. Stop or reduce discharge, if this can be done without risk. Stay upwind and if water spray is used to control vapours; dike runoff. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit or acid suit. Boots - high, neoprene (pants worn outside boots). Gloves - neoprene.

Fire and Explosion

Not combustible. Water may be used on fires involving hydrofluoric acid.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if breathing has stopped (not mouth-to-mouth method); give oxygen if breathing is laboured. Contact: remove contaminated clothing; wash eyes and skin with plenty of warm water for at least 15 minutes. Ingestion: give milk or water to conscious victim to drink. DO NOT INDUCE VOMITING. If vomiting occurs spontaneously, give more water to further dilute the chemical. Keep victim warm and quiet. If medical assistance is not immediately available, transport victim to hospital, clinic or doctor.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Absorb residual liquid on natural or synthetic sorbents.
6. Contaminated soil can be treated with lime (calcium hydroxide) to render it neutral.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

HYDROGEN H_2

IDENTIFICATION

UN No. 1049 (compressed gas)

Common Synonyms	Observable Characteristics	Manufacturers
	Colourless gas. Odourless.	Canadian manufacturers: Syncrude Canada, Fort McMurray, Alberta. Canadian Fertilizers, Medicine Hat, Alberta. Alberta Gas Chemicals, Medicine Hat, Alberta. Cominco, Carselands, Alberta.

Transportation and Storage Information

Shipping State: Gas (compressed) and liquid (compressed gas). **Classification:** Flammable gas. **Inert Atmosphere:** No requirement. **Venting:** Safety relief.	**Label(s):** Red label - FLAMMABLE GAS; Class 2.1. **Storage Temperature:** Ambient. **Hose Type:** Gas - braided-high pressure.	**Grades or Purity:** Technical; pure from 99.8% to ultra pure. **Containers and Materials:** As gas in cylinders, tube trailers; steel. As liquid in cargo or portable tanks.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas. **Solubility** (Water): 0.00015 g/100 mL (20°C). **Molecular Weight:** 2.0 **Vapour Pressure:** 8 590 mm Hg (-241°C). **Boiling Point:** -252.8°C.	**Floatability** (Water): Floats and boils. **Odour:** Odourless. **Flash Point:** <-50°C. **Vapour Density:** 0.07 (gas) (25°C). **Specific Gravity:** (liquid) 0.07 (-250°C).	**Colour:** Colourless. **Explosive Limits:** 4.0 to 75%. **Melting Point:** -259.2°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: acts as an asphyxiant by displacing air; resulting in cyanosis, diminished mental alertness, impairment and collapse. Contact: skin - frostbite.
Toxicology: Low toxicity by all routes.

TLV® - Asphyxiant. Short-term Inhalation Limits - No information.	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - No information.

Fire

Fire Extinguishing Agents: Shut off leak before attempting to extinguish fire. Use carbon dioxide, dry chemical, water or halons to extinguish. Water may be used to cool fire-exposed containers.
Behaviour in Fire: Containers may rupture violently.
Ignition Temperature: 500°C. **Burning Rate:** 9.9 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Can react vigorously with oxidizing materials. Reacts violently with bromine, chlorine, chlorine trifluoride, fluorine, lithium, nitrogen trifluoride, 1-pentol, and finely divided platinum in air.
Stability: Stable.

Environment

Water: No information.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away and upwind from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all sources of ignition. Notify manufacturer. Avoid contact with liquid. Stop or reduce discharge, if safe to do so. Notify environmental authorities.

Protective Clothing and Equipment

Outer protective clothing as required.

Fire and Explosion

Shut off leak before attempting to extinguish fire. Use carbon dioxide, dry chemical, water or halons to extinguish. Water may be used to cool fire-exposed containers. Containers may rupture violently.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin and eyes - remove contaminated clothing, flush affected areas with plenty of water and treat as for frostbite. If medical assistance is not immediately available, transport victim to doctor, clinic or hospital.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

HYDROGEN CHLORIDE HCl (anhydrous)

IDENTIFICATION

UN No. 1050

Common Synonyms	Observable Characteristics	Manufacturers
HYDROCHLORIC ACID (anhydrous)	Clear, colourless gas. Pungent, suffocating odour. Fumes in contact with humid air.	Dow Chemical Canada Inc., Sarnia, Ontario. Canadian Industries Ltd., Becancour, Quebec. Du Pont Canada, Maitland, Ontario.

Transportation and Storage Information

Shipping State: Liquid (compressed gas).
Classification: Poisonous gas.
Inert Atmosphere: No requirement.
Venting: Safety relief.

Label(s): White Label - POISONOUS GAS; Class 2.3.
Storage Temperature: Ambient.
Hose Type: Monel, stainless steel. Flexible braided, pressure.

Grades or Purity: Technical, 97.5 to 99%.
Containers and Materials: Cylinders, tank cars; steel, stainless steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas.
Solubility (Water): Soluble 82 g/100 mL (0°C); 56.1 g/100 mL (60°C).
Molecular Weight: 36.5
Vapour Pressure: 1 500 mm Hg (-76.6°C); 30 400 mm Hg (17°C).
Boiling Point: -85.0°C

Floatability (Water): Liquid, sinks and mixes.
Odour: Highly irritating, pungent and suffocating. (1 to 10 ppm, odour threshold).
Flash Point: Not flammable.
Vapour Density: 1.3
Specific Gravity: (liquid) 1.19 (-85°C).

Colour: Colourless.
Explosive Limits: Not flammable.
Melting Point: -114.2°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: vapour produces severe irritation of the upper respiratory tract, coughing, burning of throat, choking and possibly death. Contact: eyes - causes severe burns and damage; skin - burns. Ingestion: severe irritation, burning of throat and gastrointestinal tract. May be fatal.
Toxicology: Toxic by all routes.
TLV* - (Inhalation) 5 ppm; 7 mg/m^3.
Short-term Inhalation Limits - No information.

LC_{50} - Inhalation: rat = 4 701 ppm/30 min.
Delayed Toxicity - None known.

LD_{50} - Oral: rabbit = 0.9 g/kg (solution).

Fire

Fire Extinguishing Agents: Not combustible. Water may be used on fires involving hydrogen chloride. Water may be used to cool fire-exposed containers and knock down vapours.
Behaviour in Fire: Not combustible.
Ignition Temperature: Not combustible.

Burning Rate: Not combustible.

Reactivity

With Water: Soluble; forms hydrochloric acid.
With Common Materials: Reacts violently with calcium carbide, cesium carbide, lithium silicide, magnesium boride, mercuric sulfate and sodium.
Stability: Stable. Corrosive to metals when wet.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life in low concentrations. Fish toxicity: 282 ppm/96 h/mosquito fish/TLm/freshwater; 100 to 330 ppm/48 h/shrimp/LC_{50}/saltwater; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "CORROSIVE". Call Fire Department. Evacuate from downwind. Contact manufacturer. Avoid all contact and inhalation. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Boots - high, rubber (pants worn outside boots). Gloves - rubber.

Fire and Explosion

Not combustible. Water may be used on fires involving hydrogen chloride. Water may also be used to cool fire-exposed containers and knock down vapours.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Contact: immediately flush eyes and skin with plenty of warm water for 30 minutes or more and remove contaminated clothing. Inhalation: if not breathing, give artificial respiration (not mouth-to-mouth method); if breathing is laboured, give oxygen. Ingestion: give milk or water to conscious victim. Do not induce vomiting. Keep warm and quiet. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Recover undamaged containers.
5. Neutralize contaminated soil with lime (calcium hydroxide).
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

HYDROGEN FLUORIDE HF (anhydrous)

IDENTIFICATION

UN No. 1052

Common Synonyms	Observable Characteristics	Manufacturers
HYDROFLUORIC ACID (anhydrous)	Colourless liquid or gas. Pungent, suffocating odour. Fumes in humid air.	Allied Chemical Ltd., Amherstburg, Ontario, Valleyfield, Quebec. Alcan Smelters and Chemicals, Jonquière, Quebec.

Transportation and Storage Information

Shipping State: Liquid (compressed gas).
Classification: Corrosive liquid, poison.
Inert Atmosphere: No requirement.
Venting: Safety relief.

Label(s): White and black label - CORROSIVE. White label - POISON; Class 8, 2.3.
Storage Temperature: Ambient.
Hose Type: Halon TFE plastic hose, Hypalon.

Grades or Purity: Technical, 99.0%.
Containers and Materials: Cylinders, tank cars; steel, nickel-steel alloys.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas.
Solubility (Water): Soluble in all proportions.
Molecular Weight: 20.0
Vapour Pressure: 775 mm Hg (20°C); 1 200 mm Hg (33°C).
Boiling Point: 19.5°C

Floatability (Water): Soluble.
Odour: Irritating, pungent (0.1 ppm, odour threshold)
Flash Point: Not flammable.
Vapour Density: 1.86 (25°C).
Specific Gravity: 0.96 (liquid) (20°C).

Colour: Colourless.
Explosive Limits: Not flammable.
Melting Point: -83.4°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of mucous membranes, pain in throat, difficulty breathing, headache, fatigue, shock, coma. Contact: skin - readily absorbed, extreme burns, blisters and damage to tissue; eyes - burning, irreparable damage. Ingestion: irritation and burning of lips, mouth and throat, intense thirst, coughing, difficulty breathing, nausea and vomiting, shock, convulsions, coma. Can be fatal by all routes.
Toxicology: Highly toxic by inhalation, ingestion and skin absorption.

TLV® - (inhalation) 3 ppm; 2.5 mg/m^3 (as F).
Short-term Inhalation Limits - 6 ppm; 5 mg/m^3 (15 min) (as F).

LC_{50} - Inhalation: rat = 1 276 ppm/1 h
Delayed Toxicity - No information.

LD_{50} - No information.
LD_{Lo} - Intraperitoneal: rat = 0.025 g/kg

Fire

Fire Extinguishing Agents: Not combustible; however, water may be used on fires involving HF. Water may be used to cool fire-exposed containers and knock down vapours.
Behaviour in Fire: Not combustible.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: Soluble; forming hydrofluoric acid.
With Common Materials: Reacts violently with arsenic trioxide and phosphorus pentoxide.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life in very low concentrations. Fish toxicity: 60 ppm/tns/fish/lethal/freshwater; >300 ppm/48 h/shrimp/LC_{50}/saltwater.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

CORROSIVE. POISON.

Immediate Responses

Keep non-involved people away from spill area. Issue warning: "CORROSIVE, POISON". Call Fire Department. Contact manufacturer or supplier for advice. Avoid contact and inhalation. Stop or reduce discharge, if this can be done without risk. Stay upwind and if water spray is used to control vapours, dike runoff. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated acid suit are mandatory. Boots - high, neoprene (pants worn outside boots). Gloves - neoprene.

Fire and Explosion

Not combustible. Water may be used to fight fires involving HF, and to cool fire-exposed containers and knock down vapours.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: remove contaminated clothing; wash eyes and skin with plenty of warm water for at least 15 minutes. Ingestion: give milk or water to conscious victim. Do not induce vomiting. If vomiting occurs, give more water to further dilute the chemical. Keep patient warm and quiet. If medical assistance is not immediately available, transport victim to hospital, clinic or doctor.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Absorb residual liquid on natural or synthetic sorbents.
6. Contaminated soil can be treated with lime (calcium hydroxide) to render it neutral.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

HYDROGEN PEROXIDE H_2O_2 (aqueous)

IDENTIFICATION

UN No. 2015, >60%
2014, 8 to 60%

Common Synonyms	Observable Characteristics	Manufacturers	
PEROXIDE HYDROGEN DIOXIDE HYDROPEROXIDE	Clear, colourless liquid. Slightly sharp odour.	No Canadian manufacturers. Canadian suppliers: B.C. Forest Products, Crofton, B.C. Canadian Industries Ltd., Cornwall, Ont. Du Pont Canada, Maitland, Ontario.	Originating from: FMC Corp., USA E.I. Du Pont de Nemours, USA

Transportation and Storage Information

Shipping State: Liquid (aqueous solution).
Classification: Oxidizer and corrosive.
Inert Atmosphere: No requirements.
Venting: Safety relief or pressure-vacuum.
Pump Type: Aluminum, or all plastic; stainless steel.

Label(s): Yellow label - OXIDIZER; Class 5.1, Group I. Black and white label - CORROSIVE; Class 8, Group I.
Storage Temperature: Ambient.
Hose Type: Polyethylene, PVC (Tygon), 304 or 316 braided stainless steel.

Grades or Purity: Many concentrations 27.5, 30, 50, 70, 98% as aqueous solutions.
Containers and Materials: Drums (aluminum, polyethylene); tank cars, tank trucks; aluminum.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid (aqueous solution).
Solubility (Water): Soluble in all proportions.
Molecular Weight: 34.0 (for solute only).
Vapour Pressure: 27.5%, 25 mm Hg; 35%, 23 mm Hg; 50%, 18 mm Hg; 70%, 11 mm Hg (30°C).
Boiling Point: 27.5%, 105°C; 35%, 108°C; 50%, 114°C; 70%, 125°C; 150.2°C (pure).

Floatability (Water): Mixes.
Odour: Slightly sharp.
Flash Point: Not flammable.
Vapour Density: 1.2
Specific Gravity: 1.13 (35%); 1.20 (50%); 1.29 (70%) all at (20°C); 1.45 (pure).

Colour: Colourless.
Explosive Limits: Not flammable.
Melting Point: (35%) -32.8°C; (50%) -50°C; (70%) -39°C; -0.41°C (pure).

HAZARD DATA

Human Health

Symptoms: Inhalation: sore throat, coughing, laboured breathing, headache, nausea, weakness. Ingestion: pain in swallowing, intense thirst, nausea and vomiting, difficulty breathing, convulsions, coma. Contact: skin - burning, painful blistering, shock; eyes - stinging, burning, opaqueness of cornea.
Toxicology: Highly toxic by all routes.
TLV® - (inhalation) 1 ppm; 1.5 mg/m^3.
Short-term Inhalation Limits - 2 ppm; 3 mg/m^3 (15 min).

LC_{50} - Inhalation: rat = 2 000 mg/m^3/4 h (90%).
Delayed Toxicity - None known.

LD_{50} - Skin: rat = 4.06 g/kg (90%).

Fire

Fire Extinguishing Agents: Not combustible. In fires involving H_2O_2 use water; H_2O_2 may cause other firefighting agents to be ineffective. Use water to cool fire-exposed containers.
Behaviour in Fire: Can cause ignition of combustible material on contact. May decompose with explosive violence on contact with iron, copper, chromium, brass, bronze, lead, silver, manganese and their salts.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: No reaction. Soluble.
With Common Materials: Reacts violently with acetic acid, acetic anhydride, acetone, antimony and arsenic trisulfide, brass, bronze, t-butylalcohol, cellulose, charcoal, chlorosulfonic acid, chromium, copper, cupric sulfide, ethyl alcohol, ferrous sulfide, formic acid, organic matter, hydrazine, iron, lead, lead sulfide, magnesium, manganese, manganese dioxide, mercuric oxide, nitric acid, platinum, potassium, potassium permanganate, silver, sodium, and sodium iodate.
Stability: Stable, within the limits of the foregoing. Higher concentrations are less stable and more reactive.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 40 ppm/tns/(fingerling trout)/toxic/saltwater; BOD: None.
Land-Air: No information.

EMERGENCY MEASURES

Special Hazards

OXIDIZER. CORROSIVE. Reactive.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "OXIDIZER, CORROSIVE". Call Fire Department. Contact manufacturer or supplier for advice and possible assistance. Avoid contact and inhalation. Stop or reduce discharge, if this can be done without risk. Contain spill by diking with earth. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus. Boots - neoprene, or rubber (pants worn outside boots). Gloves - rubber, neoprene or PVC. Outerwear - rubber, neoprene or PVC. Flammable clothing, such as cotton, rayon, leather or wool, should not be worn when in contact with high-strength hydrogen peroxide.

Fire and Explosion

Not combustible. In fires involving H_2O_2, use water; H_2O_2 may cause other firefighting agents to be ineffective. Use water to cool fire-exposed containers.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Contact: eyes - irrigate with plenty of water; skin - remove contaminated clothing and flush affected areas with plenty of water. Ingestion: give water to conscious victim to drink. Inhalation: remove at once from further exposure. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth.
4. If concentrated, dilute with at least an equal volume of water.
5. Remove material with pumps or vacuum equipment and place in appropriate containers.
6. Recover undamaged containers.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

HYDROGEN SULFIDE H_2S

IDENTIFICATION

UN No. 1053

Common Synonyms	Observable Characteristics	Manufacturers
SULPHURETTED HYDROGEN HYDROGEN SULPHIDE SULFUR HYDRIDE	Colourless gas. Offensive rotten-egg odour.	Thio-Pet Chemicals Limited, Fort Saskatchewan, Alta. Laurentide Chemicals & Sulphur Ltd., Montreal East, Que.

Transportation and Storage Information

Shipping State: Liquid (compressed gas).
Classification: Flammable, poisonous gas.
Inert Atmosphere: No requirement.
Venting: Safety relief.

Label(s): Red label - FLAMMABLE GAS; Class 3.
White label - POISON; Class 2.3.
Storage Temperature: Ambient.

Grades or Purity: Technical, 98.5%; H_2S present in many concentrations from gas wells.
Containers and Materials: Cylinders, tank cars; steel.

Physical and Chemical Characteristics

Physical state (20°C, 1 atm): Gas.
Solubility (Water): 0.5 g/100 mL (20°C).
Molecular Weight: 34.1
Vapour Pressure: 7 600 mm Hg (-0.4°C); 15 200 mm Hg (25.5°C).
Boiling Point: -60.2°C.

Floatability (Water): Liquid floats, boils and dissolves.
Odour: Rotten-eggs (0.005 ppm, odour threshold).
Flash Point: <-50°C.
Vapour Density: 1.2 (0°C).
Specific Gravity: 0.95 (-60°C).

Colour: Colourless.
Explosive Limits: 4.0 to 44%.
Melting Point: -83 to -86°C.

HAZARD DATA

Human Health

Symptoms: Insidious poison, since sense of smell may be fatigued and fail to give warning of high concentrations. Inhalation: irritation of nose, throat and eyes, sneezing, headache, dizziness, nausea and vomiting, pale complexion, cold sweat, diarrhea, muscular weakness, drowsiness, unconsciousness and death. Contact: skin - irritation, painful inflammation; eyes - irritation, watering, inflammation.
Toxicology: Highly toxic by inhalation and contact.

TLV* - (inhalation) 10 ppm; 14 mg/m^3.
Short-term Inhalation Limits - 15 ppm; 21 mg/m^3 (15 min).

LC_{50} - Inhalation: mouse = 673 ppm/1 h
LC_{50} - Inhalation: rat = 444 ppm.
Delayed Toxicity - No information.

LD_{50} - No information.

Fire

Fire Extinguishing Agents: Stop flow of gas. Use water to keep fire-exposed containers cool.
Behaviour in Fire: Flashback may occur along vapour trail. Emits fumes of SO_x when heated to decomposition.
Ignition Temperature: 260°C.
Burning Rate: (Liquid) 2.3 mm/min.

Reactivity

With Water: No reaction; soluble.
With Common Materials: Can react vigorously with oxidizing materials. Reacts violently with chlorine monoxide, chromic anhydride, copper, fluorine, acetaldehyde, lead dioxide, nitric acid, nitrogen trichloride, nitrogen trifluoride.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life in low concentrations. Fish toxicity: 1.38 ppm/48 h/fathead minnow/TLm/freshwater; 10 mg/L/96 h/goldfish/LC_{100}/freshwater; 0.86 ppm/24 h/trout/LC_{100}/freshwater; BOD: Not available.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE. POISON. Odour sensation lost with high concentrations or long period of exposure.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE, POISON". CALL FIRE DEPARTMENT. Call manufacturer for guidance and assistance. Eliminate all ignition sources. If necessary, evacuate people downwind. Work from upwind. Use water spray to control vapours and to cool containers. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self contained breathing apparatus and totally encapsulated suit. Gloves - rubber. Boots - rubber.

Fire and Explosion

Stop flow of gas. Use water to cool fire-exposed containers. Flash back may occur along vapour trail. Emits toxic SO_x fumes when heated to decomposition.

First Aid

Move victim out of spill site to fresh air. Call medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Keep patient warm. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water-Land-Air

Because of the properties of hydrogen sulfide, its shipment in refrigerated, pressurized tank cars with specialized valve and relief devices, it is inadvisable for an inexperienced person to try to control an emergency situation.

1. Contact the manufacturer, who will suggest appropriate action or may be able to arrange for on-the-site assistance. Do not attempt to control a leak or deal with an emergency situation without this guidance.
2. Response possibilities include: allowing dispersal into the atmosphere.
3. Vapours can be controlled with fog or water spray.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

ISOPROPYL ALCOHOL $CH_3CHOHCH_3$

IDENTIFICATION

UN No. 1219

Common Synonyms	Observable Characteristics	Manufacturers
ISOPROPANOL DIMETHYLCARBINOL 2-PROPANOL sec-PROPYL ALCOHOL RUBBING ALCOHOL	Clear, colourless liquid. Alcohol odour.	Gulf Oil Canada Ltd., Montreal, Quebec. Shell Canada Ltd., Corunna, Ontario.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable liquid.
Inert Atmosphere: No requirement.
Venting: Open (flame arrester) or pressure-vacuum.
Pump Type: Gear, centrifugal, flammable liquid types.

Label(s): Red label - FLAMMABLE LIQUID; Class 3.2, Group II.
Storage Temperature: Ambient.
Hose Type: Polyethylene, polypropylene, butyl, Hypalon, natural rubber.

Grades or Purity: Commercial, technical, 91%, 95%, 99%.
Containers and Materials: Drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): Soluble in all proportions.
Molecular Weight: 60.1
Vapour Pressure: 32 mm Hg (20°C); 44 mm Hg (25°C); 57 mm Hg (30°C).
Boiling Point: 82.4°C.

Floatability (Water): Floats and mixes.
Odour: Alcohol-like (40 ppm, odour threshold).
Flash Point: 12°C (c.c.); 14°C (c.c. 88% solution).
Vapour Density: 2.1
Specific Gravity: 0.79 (20°C).

Colour: Colourless.
Explosive Limits: 2.3% to 12.7%.
Melting Point: -86 to -89°C.

HAZARD DATA

Human Health

Symptoms: Contact: eyes - severely irritating; skin - defatting and cracking. Inhalation: causes depression of the central nervous system, nausea, vomiting, depressed respiration, abdominal pain. Ingestion: dizziness, headache, nausea, vomiting.
Toxicology: Low toxicity by contact and moderate toxicity by ingestion.

TLV®- (inhalation, skin) 400 ppm; 980 mg/m^3.
Short-term inhalation Limits - 500 ppm, 1 225 mg/m^3 (15 min).

LC_{50} - No information.
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 5.84 g/kg

Fire

Fire Extinguishing Agents: For fires use dry chemical, carbon dioxide or alcohol foam. Water may be ineffective but may be used to cool fire-exposed containers.
Behaviour in Fire: Flashback may occur along vapour trail.
Ignition Temperature: 399°C.
Burning Rate: 2.3 mm/min.

Reactivity

With Water: No reaction; soluble.
With Common Materials: Can react vigorously with oxidizing materials. Can react violently with oleum, phosgene and potassium-t-butoxide.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. Fish toxicity: 900 to 1 100 ppm/24 h/chub/critical/freshwater; 1 400 mg/L/48 h/brine shrimp/LC_{50}/saltwater; Aquatic toxicity rating = 100 to 1 000 ppm/96 h/TLm/freshwater; BOD: 129 to 159%; 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all ignition sources. Notify manufacturer or supplier. Dike to contain spill and prevent runoff. Stop or reduce discharge, if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus (in fire). Gloves - rubber or plastic. Outer clothing - suitable for situation, coveralls, etc. Boots - rubber.

Fire and Explosion

Use dry chemical, carbon dioxide or alcohol foam. Water may be ineffective on fire, may be used to cool fire-exposed containers. Flash back may occur along vapour trail.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Contact: remove contaminated clothing; wash eyes and skin with plenty of water. Inhalation: give artificial respiration if breathing has stopped; oxygen, if breathing is laboured. Ingestion: give water to conscious victim and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge vacuum pump to remove contaminants liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Dike to prevent runoff from rainwater or water application.
5. Remove material with pumps or vacuum equipment and place in appropriate containers.
6. Recover undamaged containers.
7. Absorb residual liquid on natural or synthetic sorbents.
8. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

KEROSENE

IDENTIFICATION

UN No. 1223

Common Synonyms	Observable Characteristics	Manufacturers
STOVE (RANGE) OIL JET FUEL: JP-1 ILLUMINATING OIL KEROSINE RANGE OIL FUEL OIL NO. 1 COAL OIL	Colourless or pale yellow liquid. Gasoline-like odour.	Universally available.

Transportation and Shipping Information

Shipping State: Liquid.
Classification: Flammable liquid.
Inert Atmosphere: No requirement.
Venting: Open (flame arrester).
Pump Type: Gear or centrifugal.

Label(s): Red label - FLAMMABLE LIQUID; Class 3.3, Group II.
Storage Temperature: Ambient.
Hose Type: Neoprene, polyethylene, Viton.

Grades or Purity: Mixture of light hydrocarbon distillates.
Containers and Materials: Drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 0.0002 to 0.0004 g/100 mL (20°C).
Molecular Weight: Variable.
Vapour Pressure: ~5 mm Hg (20°C).
Boiling Point: 150 to 300°C.

Floatability (Water): Floats.
Odour: Gasoline-like (odour threshold about 1 ppm).
Flash Point: 43 to 72°C.
Vapour Density: 4.5
Specific Gravity: 0.8 to 0.85 (20°C).

Colour: Colourless or pale yellow.
Explosive Limits: 0.7 to 5%.
Melting Point: -43 to -49°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: nausea, vomiting, coughing, headache. Ingestion: nausea, vomiting, weakness, dizziness, slow and shallow respiration, convulsions, unconsciousness. Contact: skin - irritating and defatting; eyes - irritation.
Toxicology: Very low toxicity by all routes.
TLV® - No information.
Short-term Inhalation Limits - No information.
LC_{50} - No information.
Delayed Toxicity - No information.
LD_{50} - Oral: guinea pig = 20 g/kg

Fire

Fire Extinguishing Agents: Use dry chemical, foam, carbon dioxide. Water may be ineffective but may be used to cool fire-exposed containers.
Behaviour in Fire: No information.
Ignition Temperature: 210°C.
Burning Rate: 4 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Can react with strong oxidizing agents.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 2 990 ppm/24 h/bluegill/freshwater; 100-1 000 ppm/96 h/rainbow trout/LC_{50}/freshwater;
BOD: 53%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all sources of ignition. Notify supplier or manufacturer. Stop or reduce discharge, if this can be done without risk. Dike spill area to contain runoff. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - in fires or closed spaces, use self-contained breathing apparatus; otherwise, Goggles or face shield. Coveralls. Rubber gloves. Rubber boots (high) - wear pants outside boots.

Fire and Explosion

Use dry chemical, foam or carbon dioxide to extinguish. Water may be used to cool fire-exposed containers.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if breathing has stopped, give oxygen if breathing is laboured. Contact: eyes - irrigate with plenty of water for at least 15 minutes; skin - remove contaminated clothing and flush affected areas with plenty of water. Ingestion: give conscious victim water to drink, do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

LATEX

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
ARCONITRILE BUTADIENE RUBBER PLASTIC LATEX LATEX, LIQUID SYNTHETIC SYNTHETIC RUBBER LATEX NATURAL RUBBER LATEX	White liquid. Variable and characteristic odour.	Universally available.

Transportation and Shipping Information

Shipping State: Liquid.
Classification: None.
Inert Atmosphere: No requirement.
Venting: Open.
Pump Type: No information.

Label(s): Not regulated.
Storage Temperature: Ambient.
Hose Type: No information.

Grades or Purity: Regular and concentrated.
Containers and Materials: Drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): Insoluble; but may mechanically mix.
Molecular Weight: Variable.
Vapour Pressure: No information.
Boiling Point: >200°C.

Floatability (Water): Sinks in freshwater; floats in saltwater (may mechanically mix).
Odour: Variable and characteristic.
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: 1.06 (25°C).

Colour: White.
Explosive Limits: Not flammable.
Melting Point: >150°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of mucous membranes. Ingestion: dangerous to ingest, as coagulation may occur internally. Contact: skin - irritation, eyes - irritation.
Toxicology: Low toxicity by all routes.
TLV® No information.
Short-term Inhalation Limits - No information.
LC_{50} - No information.
Delayed Toxicity - No information.
LD_{50} - No information.

Fire

Fire Extinguishing Agents: Not flammable. Most fire extinguishing agents may be used on fires involving latex.
Behaviour in Fire: Splatters when burning.
Ignition Temperature: No information.
Burning Rate: No information.

Reactivity

With Water: No reaction.
With Common Materials: No information.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from spill site. Call Fire Department. Stop or reduce discharge if safe to do so. Notify manufacturer. Notify environmental authorities.

Protective Clothing and Equipment

In fires Respiratory protection - self-contained breathing apparatus; otherwise protective clothing as required.

Fire and Explosion

Not flammable. Most fire extinguishing agents may be used on fires involving latex. Splatters when burning.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and wash affected areas with plenty of water; eyes - irrigate with water. Ingestion: give water to conscious victim to drink; get prompt medical assistance. If medical assistance is not immediately available, transport victim to doctor, clinic or hospital.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

Floating

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Sinking

1. Stop or reduce discharge if safe to do.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).
4. May be dumped in a municipal landfill (approval of environmental authorities required).

LEAD ACETATE $Pb(CH_3COO)_2 \cdot 3H_2O$

IDENTIFICATION

UN No. 1616

Common Synonyms	Observable Characteristics	Manufacturers
LEAD ACETATE TRIHYDRATE SUGAR OF LEAD PLUMBOUS ACETATE	White to brown or grey powder or flakes. Odourless.	Anachemia Chemicals Ltd., Montreal, Que., Toronto, Ont.

Transportation and Storage Information

Shipping State: Solid. **Classification:** Poison. **Inert Atmosphere:** No requirement. **Venting:** Open.	**Label(s):** White label - POISON; Class 6.1, Group III. **Storage Temperature:** Ambient.	**Grades or Purity:** Technical, 97%. **Containers and Materials:** Multiwall paper bags, drums.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid. **Solubility** (Water): 45.6 g/100 mL (15°C); 200 g/100 mL (100°C). **Molecular Weight:** 379.3 **Vapour Pressure:** No information. **Boiling Point:** Decomposes at 200°C.	**Floatability** (Water): Sinks and mixes. **Odour:** Odourless. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** 2.55 (20°C).	**Colour:** White to brown or grey. **Explosive Limits:** Not flammable. **Melting Point:** Loses water at 75°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: of dust, mist or fumes, irritation of nose and eyes, headache, stomach cramps and fatigue. Ingestion: metallic taste in mouth, constriction of throat, stomach pains, nausea, vomiting, diarrhea, convulsions, coma. Contact: skin - irritation, inflammation; eyes - inflammation.
Toxicology: High toxic by ingestion.

TLV® (inhalation) 0.15 mg/m^3 (as Pb). Short-term Inhalation Limits - 0.45 mg/m^3 (15 min) (as Pb).	LC_{50} - No information. Delayed Toxicity - Cumulative poison. Suspected carcinogen.	LD_{50} - Intraperitoneal: guinea pig = 0.22 g/kg TD_{Lo} - Oral: rat = 8.52 g/kg

Fire

Fire Extinguishing Agents: Most fire extinguishing agents may be used. Use water sparingly.
Behaviour in Fire: In fires, toxic PbO fumes are released.
Ignition Temperature: >280°C. **Burning Rate:** No information.

Reactivity

With Water: No reaction; soluble.
With Common Materials: Reacts violently with $KBrO_3$ (potassium bromate).
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 7.5 mg/L (as Pb)/4 days/minnow/TLm/soft water.
Land-Air: No information.
Food Chain Concentration Potential: Fish and terrestrial animals are capable of concentrating lead.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "POISON". Avoid contact and inhalation. Dike to prevent runoff from rainwater or water application. Lightly wet down dry spillage to prevent wind drift of dust. Notify manufacturer or supplier. Notify environmental authorities.

Protective Clothing and Equipment

In fire or enclosed spaces, Respiratory protection - self-contained breathing apparatus. Otherwise, dust respirators (with suitable filters) or metal fume respirators for normal situations. Rubber gloves and boots will prevent contact. Frequent changes of clothing and footwear should be provided for contaminated clothing, and footwear should be washed immediately after contact.

Fire and Explosion

Most fire extinguishing agents may be used. Use water sparingly. In fires, toxic PbO fumes are released.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing, and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give water to conscious victim to drink, and induce vomiting. If medical assistance is not immediately available, transport victim to doctor, clinic or hospital.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contained contaminants and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Broken and empty bags or containers should be handled carefully to avoid scattering of dust.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

LEAD CHROMATE $PbCrO_4$

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
CHROME YELLOW LEAD CHROMATE (IV) PARIS YELLOW	Yellow crystals. Odourless.	Hercules Canada, St. Jean, Quebec. Reed, Ajax, Ontario.

Transportation and Storage Information

Shipping State: Solid. **Classification:** None. **Inert Atmosphere:** No requirement. **Venting:** Closed.	**Label(s):** Not regulated. **Storage Temperature:** Ambient.	**Grades or Purity:** Technical. **Containers and Materials:** Kegs, drums; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid. **Solubility (Water):** 0.000 007 to 0.000 017 g/100 mL (20°C). **Molecular Weight:** 323.2 **Vapour Pressure:** No information. **Boiling Point:** Decomposes at 844°C.	**Flotability (Water):** Sinks. **Odour:** Odourless. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** 6.1	**Colour:** Yellow. **Explosive Limits:** Not flammable. **Melting Point:** 844°C; decomposes.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of nose and eyes, headache, stomach cramps, fatigue. Ingestion: metallic taste in mouth, stomach pains, nausea and vomiting, diarrhea, convulsions, coma; Contact: skin - irritation and inflammation; eyes - watering, irritation and inflammation.
Toxicology: Highly toxic by ingestion.

TLV® (inhalation) 0.05 mg/m^3 (as Cr). Short-term Inhalation Limits - No information.	LC_{50} - No information. Delayed Toxicity - Suspected carcinogen.	LD_{50} - Intraperitoneal: guinea pig = 0.40 g/kg

Fire

Fire Extinguishing Agents: Not combustible; most fire extinguishing agents may be used on fires involving lead chromate.
Behaviour in Fire: Decomposes at 844°C, liberating oxygen and toxic lead compounds.

Ignition Temperature: Not combustible.	**Burning Rate:** Not combustible.

Reactivity

With Water: No reaction.
With Common Materials: May react with ferric ferrocyanide.
Stability: Stable.

Environment

Water: Prevent entry into water intakes or waterways.
Land-Air: No information.
Food Chain Concentration Potential: May be concentrated (as lead) in tissue.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Avoid contact and inhalation of fumes. Stop or reduce discharge if this can be done without risk. Notify supplier and environmental authorities.

Protective Clothing and Equipment

Respiratory protection - in confined spaces or fires - self-contained breathing apparatus and totally encapsulated suit, otherwise protective clothing as required. Gloves: rubber or plastic.

Fire and Explosion

Not combustible, most fire extinguishing agents may be used on fires involving lead chromate. At high temperatures lead chromate decomposes yielding oxygen and toxic lead compounds.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if breathing has stopped; if laboured, give oxygen. Contact: skin and eyes - remove contaminated clothing and flush affected areas with plenty of water. Ingestion: give conscious victim plenty of water to drink and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other material.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

LEAD NITRATE $Pb(NO_3)_2$

IDENTIFICATION

UN No. 1469

Common Synonyms	Observable Characteristics	Manufacturers
NITRIC ACID, LEAD II SALT	White crystals. Odourless.	No Canadian manufacturers.

Transportation and Storage Information

Shipping State: Solid.
Classification: Oxidizing material. Poison.
Inert Atmosphere: No requirement.
Venting: Open.
Label(s): Yellow label - OXIDIZER; Class 5.1, Group II; White label - POISON; Class 6.1, Group II.
Storage Temperature: Ambient.
Grades or Purity: Technical, 98+%.
Containers and Materials: Multiwall paper bags and drums.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm.): Solid.
Solubility (Water): 37.7 g/100 mL (0°C); 127 g/100 mL (100°C).
Molecular Weight: 331.2
Vapour Pressure: No information.
Boiling Point: Decomposes at 470°C.
Floatability (Water): Sinks and mixes.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: 4.53 (30°C).
Colour: White.
Explosive Limits: Not flammable.
Melting Point: Decomposes at 470°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: of dust, mist or fumes, irritation of nose and eyes, headache, stomach cramps and fatigue. Ingestion: metallic taste in mouth, constriction of throat, stomach pains, nausea, vomiting, diarrhea, convulsions, coma. Contact: skin - irritation, inflammation; eyes - inflammation.
Toxicology: Highly toxic by ingestion.
TLV® (inhalation) 0.15 mg/m^3 (as Pb).
Short-term Inhalation Limits - 0.45 mg/m^3 (15 min) (as Pb).
LC_{50} - No information.
Delayed Toxicity - Cumulative poison.
LD_{50} - No information.
LD_{Lo} - Oral: guinea pig = 0.5 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used. Use water sparingly.
Behaviour in Fire: Not combustible. When heated to decomposition, can emit toxic nitrogen oxide and lead oxide fumes.
Ignition Temperature: Not flammable.
Burning Rate: Not flammable.

Reactivity

With Water: No reaction; soluble.
With Common Materials: Strong oxidizer, can ignite organic materials. Reacts violently with ammonium thiocyanate, carbon and lead hypophosphite.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 240 ppm/48 h/mosquito fish/TLm/freshwater.
Land-Air: No information.
Food Chain Concentration Potential: Fish and terrestrial animals are capable of concentrating lead.

EMERGENCY MEASURES

Special Hazards

OXIDIZER. POISON.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "OXIDIZER. POISON". Avoid contact and inhalation. Call Fire Department. Dike to prevent runoff from rainwater or water application. Lightly wet down dry spillage to prevent wind drift or dust. Notify manufacturer or supplier. Notify environmental authorities.

Protective Clothing and Equipment

In fire or enclosed spaces, Respiratory protection - self-contained breathing apparatus. Otherwise, dust respirators (with suitable filters) or metal fume respirators for normal situations. Gloves and boots - rubber. Frequent changes of clothing and footwear should be provided. Contaminated clothing and footwear should be washed immediately after contact.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used. Use water sparingly.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing, and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give water to conscious victim to drink, and induce vomiting. If medical assistance is not immediately available, transport victim to doctor, clinic or hospital.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Broken and empty bags or containers should be handled carefully to avoid scattering of dust.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

LEAD OXIDES (black) Pb_2O (red) Pb_3O_4 (yellow) PbO

IDENTIFICATION

Common Synonyms			Observable Characteristics	Manufacturers
(Yellow) PbO Lead Oxide, Yellow Plumbous Oxide Lead Monoxide	(Red) Pb_3O_4 Red Lead Minium Plumboplumic Oxide Lead Oxide, Red Lead Tetroxide	(Black) Pb_2O Lead Oxide, Black Litharge, Leaded	Yellow, red or black powder. Odourless.	Canada Metal Co. Ltd., Toronto, Ont., Winnipeg, Man. Carter White Lead Co. of Canada Ltd., Montreal, Que. Metalex Products, Vancouver, B.C.

Transportation and Storage Information

Shipping State: Solid.
Classification: Not regulated.
Inert Atmosphere: No requirement.
Venting: Open.

Label(s): Not regulated. Voluntary white label - POISON.
Storage Temperature: Ambient.

Grades or Purity: Yellow (litharge) - assay 98% and battery grades, 50 to 95% PbO. Red (red lead) - 85,95,97,98% PbO. Black - usually a mixture of Pb and PbO.
Containers and Materials: Multiwall paper bags, cans, drums.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): Yellow 0.0017 g/100 mL (20°C); black insoluble; red 0.0026 g/100 mL (25°C).
Molecular Weight: Yellow, 223.2; red, 685.6; black, 430.4
Vapour Pressure: No information.
Boiling Point: Yellow, >886°C; red decomposes 500°C; black, decomposes upon heating.

Floatability (Water): Sinks.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: Yellow, 9.2 to 9.7; red, 8.8 to 9.2; black, 8.3 (20°C).

Colour: Yellow, red, black.
Explosive Limits: Not flammable.
Melting Point: Yellow, 888°C; red decomposes 500 to 530°C; black decomposes with heat.

HAZARD DATA

Human Health

Symptoms: Inhalation: of dust, mist or fumes; irritation of nose and eyes, headache, stomach cramps and fatigue. Ingestion: metallic taste in mouth, constriction of throat, stomach pains, vomiting, diarrhea, convulsions and coma. Contact: skin - irritation, inflammation; eyes - inflammation.
Toxicology: Highly toxic by ingestion.
TLV® - (inhalation) 0.15 mg/m^3 (as Pb).
Short-term Inhalation Limits - 0.45 mg/m^3 (15 min).

LC_{50} - No information.
Delayed Toxicity - Cumulative poison.

LD_{50} - Intraperitoneal: guinea pig = 0.22 g/kg
LD_{Lo} - Intraperitoneal: rat = 0.43 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing may be used on fires involving lead oxides.
Behaviour in Fire: Toxic Pb and PbO and fumes may be released in fires or when heated to decomposition.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: No reaction.
With Common Materials: In general, Pb oxides are oxidizing agents. Reacts violently with aluminum, hydrogen trisulfide, sodium, sulfur trioxide, and titanium.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: (Yellow) >56 000 ppm/96 h/mosquito fish/TLm/turbid water.
Land-Air: No information.
Food Chain Concentration Potential: Fish and terrestrial animals are capable of concentrating lead.

EMERGENCY MEASURES

Special Hazards

POISON. OXIDIZER.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "POISON". Notify manufacturer or supplier. Avoid contact or inhalation. Dike to prevent runoff from rainwater or water application. Lightly wet down dry spillage to prevent wind drift of dust. Notify environmental authorities.

Protective Clothing and Equipment

In fires or enclosed spaces, Respiratory protection - self-contained breathing apparatus, otherwise dust respirators (with suitable filters) for protection against dust under normal conditions. Rubber gloves and boots will prevent contact. Frequent changes of clothing should be provided. Contaminated clothing and footwear to be washed immediately after contact.

Fire and Explosion

Not combustible, most fire extinguishing agents may be used.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing, and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give water to conscious victim to drink, and induce vomiting. If medical assistance is not immediately available, transport victim to doctor, clinic or hospital.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Broken paper bags should be handled carefully to avoid scattering of dust.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

LEAD OXIDES (black) Pb_2O
(red) Pb_3O_4
(yellow) PbO

MAGNESIUM HYDROXIDE $Mg(OH)_2$

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers	
MAGNESIUM HYDRATE MAGNESIUM MAGNA MILK OF MAGNESIA	White powder. Odourless.	No Canadian manufacturers. Canadian suppliers: Dow Chemical Canada Inc., Sarnia, Ontario. Chorney Chemical, Toronto, Ontario. Frank E. Dempsey, Toronto, Ontario.	Originating from: Dow Chemical, Luddington, Mich. Barcroft, USA. Reheis Chemical, USA.

Transportation and Storage Information

Shipping State: Solid.
Classification: None.
Inert Atmosphere: No requirement.
Venting: Open.
Label(s): Not regulated.
Storage Temperature: Ambient.
Grades or Purity: Technical.
Containers and Materials: Multiwall paper bags, drums.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): 0.18 g/100 mL (25°C); 0.04 g/100 mL (100°C).
Molecular Weight: 58.3
Vapour Pressure: No information.
Boiling Point: Loses water at 350°C.
Floatability (Water): Sinks.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: 2.36 (20°C).
Colour: White.
Explosive Limits: Not flammable.
Melting Point: Loses water at 350°C.

HAZARD DATA

Human Health

Symptoms: Contact: skin and eyes - irritation and redness. Ingestion: abdominal pain and diarrhea.
Toxicology: Low toxicity by all routes.
TLV® - No information.
Short-term Inhalation Limits - No information.
LC_{50} - No information.
Delayed Toxicity - No information.
LD_{50} - No information.

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used on fires involving magnesium hydroxide.
Behaviour in Fire: Upon heating, decomposes to magnesium oxide (MgO) and water vapour.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: No reaction.
With Common Materials: Reacts violently with maleic anhydride and phosporus. Reacts with acids.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from spill site. Notify manufacturer. Dike to prevent runoff. Notify environmental authorities.

Protective Clothing and Equipment

In fires or confined spaces, Respiratory protection - use self-contained breathing apparatus. Otherwise, protective clothing and equipment as required.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: skin - remove contaminated clothing and wash affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give plenty of water to conscious victim to drink. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

MALATHION $(CH_3O)_2P(S)SCH(COOC_2H_5)CH_2COOC_2H_5$

IDENTIFICATION

UN No. 2783
Danger Group According to Percentage of Active Substance
Group III liquid 30 to 100%

Common Synonyms	Observable Characteristics	Manufacturers
S-1,2-BIS (ETHOXYCARBONYL)ETHYL O,O-DIMETHYL PHOSPHORODITHIOATE **Common Trade Names** CALMATHION, CELTHION, CYTHION, MALATIOZOL (A commonly-used general purpose insecticide.)	Yellow to dark brown liquid or white to brown powder. Skunk-like odour.	Canadian Industries Ltd., (C.I.L.), Montreal, Quebec. Chipman Chemicals Ltd., Stoney Creek, Ont. Cyanamid Canada, Willowdale, Ont.

Transportation and Storage Information

Shipping State: Liquid or solid (wettable powder).
Classification: None.
Inert Atmosphere: No requirement.
Venting: Closed.
Pump Type: No information.

Label(s): Not regulated.
Storage Temperature: Ambient.
Hose Type: No information.

Grades or Purity: Various purities as detailed below.
Containers and Materials: Glass bottles, cans, drums; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid (technical).
Solubility (Water): 0.0145 g/100 mL (technical).
Molecular Weight: 330 (technical).
Vapour Pressure: 0.00004 mm Hg (30°C).
Boiling Point: 156°C (at 0.7 mm Hg pressure).

Floatability (Water): Technical sinks, SN floats.
Odour: Skunk-like.
Flash Point: 54°C (c.c.) SN; 163°C (c.c.) technical; 22 to 32°C (c.c.) EC; PP is also flammable.
Vapour Density: No information.
Specific Gravity: 1.23, 25°C (technical).

Colour: Liquid, yellow to dark brown; powder, white to brown.
Explosive Limits: Technical not flammable; SN, PP and EC are flammable.
Melting Point: 2.9°C (technical).

HAZARD DATA

Human Health

Symptoms: Inhalation: headache, tightness in chest, wheezing, throat constriction. Contact: eyes - irritation; skin - irritation; may be absorbed. Ingestion: abdominal cramps, nausea, vomiting, diarrhea.
Toxicology: Moderately by ingestion and contact.
TLV - (skin) 10 mg/m^3
Short-term Inhalation Limits - No information.

LC_{50} - No information.
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 0.885 g/kg
LD_{50} - Oral: man = 0.857 g/kg

Fire

Fire Extinguishing Agents: Most fire extinguishing agents may be used on fires involving malathion. Water spray should be used to cool fire-exposed containers.
Behaviour in Fire: In fires or when heated to decomposition releases toxic SO_x, PO_x and other fumes.
Ignition Temperature: Variable.
Burning Rate: No information.

Reactivity

With Water: No reaction; only WC insoluble.
With Common Materials: May react with oxidizing agents.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 16 ppm/96 h/fathead minnow/LC_{50}/freshwater; 0.2 ppm/96 h/rainbow trout/LC_{50}/freshwater; 0.12 ppm/24 h/bluegill/LC_{50}/freshwater; 0.33 to 1 ppm/48 h/brown shrimp/LC_{50}/saltwater; 0.032/24 h/grass shrimp/LC_{50}/saltwater.
Land-Air: LD_{50}/exposed for 5 days/Oral: duck/>5 000 ppm; LD_{50}/exposed for 5 days/Oral: pheasant/2 500 to 4 500 ppm.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Stop or reduce discharge if safe to do so. Notify manufacturer or supplier. Dike to contain material or water runoff. Notify environmental authorities.

Protective Clothing and Equipment

In fires or confined spaces - Respiratory Protection - self-contained breathing apparatus and totally encapsulated suit. Otherwise, approved pesticide respirator and impervious outer clothing.

Fire and Explosion

Use carbon dioxide, foam or dry chemical to extinguish. Releases toxic fumes in fires.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give water to conscious victim to drink and induce vomiting; in the case of petroleum distillates, do not induce vomiting for fear of aspiration and chemical pneumonia. If medical assistance is not immediately available, transport victim to hospital, doctor, or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.

Floats
3. If possible contain discharge by booming.
4. If floating, skim and remove.

Sinks or mixes
3. If possible contain discharge by damming or water diversions.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.

5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. If liquid, remove material with pumps or vacuum equipment and place in appropriate containers.
5. If solid, remove material by manual or mechanical means.
6. Recover undamaged containers.
7. Absorb residual liquid on natural or synthetic sorbents.
8. Remove contaminated soil for disposal.
9. Notify environmental authorities to discuss cleanup and disposal of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

Available Formulations

Technical Grade: Purity: typically 95% malathion.
Properties: combustible.

Formulations:

Type:	Purity:	Properties:
DU - dust or wettable powder	- typically 4% malathion, remainder inerts (e.g. clay, talc).	- dispersible in water, low combustibility
PP - pressurized product	- typically 3% malathion	- combustible and explosive
EC - emulsifiable concentrate	- typically 20% malathion	- combustible
SN - solution	- typically 3% malathion, large percentage of petroleum distillates	- combustible, may be flammable; floats on water

MALATHION $(CH_3O)_2P(S)SCH(COOC_2H_5)CH_2COOC_2H_5$

MALEIC ANHYDRIDE $(CHCO)_2O$

IDENTIFICATION

UN No. 2215

Common Synonyms	Observable Characteristics	Manufacturers
TOXILIC ANHYDRIDE cis-BUTENEDIOIC ANHYDRIDE 2,5-FURANDIONE MALEIC ACID, ANHYDRIDE	Colourless to white, crystals or solid. Choking acrid odour.	Monsanto Canada, Montreal, Quebec. BASF Canada, Cornwall, Ontario.

Transportation and Storage Information

Shipping State: Solid. **Classification:** Corrosive. **Inert Atmosphere:** No requirement. **Venting:** Open.	**Label(s):** Black and white label: CORROSIVE; Class 8, Group III. **Storage Temperature:** Ambient.	**Grades or Purity:** Commercial; 99.5%. **Containers and Materials:** Drums; fibre and steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid. **Solubility (Water):** Reacts 16 g/100 mL (30°C). **Molecular Weight:** 98.1 **Vapour Pressure:** 0.00005 mm Hg (20°C); 0.0002 mm Hg (30°C). **Boiling Point:** 200 to 202°C.	**Floatability (Water):** Reacts, sinks or floats depending on material. **Odour:** Choking, acrid (0.3 to 0.5 ppm). **Flash Point:** 102°C (c.c.) **Vapour Density:** 3.4 **Specific Gravity:** 1.3 (60°C); 0.93 (20°C).	**Colour:** Colourless to white. **Explosive Limits:** 1.4 to 7.1%. **Melting Point:** 53°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of throat and respiratory tract, bronchitis; Ingestion: abdominal pain, vomiting, nausea. Contact: skin - serious burns; eyes - severe burning.
Toxicology: Highly toxic upon contact with skin and eyes.

TLV® 0.25 ppm, 1 mg/m^3.	LC_{50} - No information.	LD_{50} - Oral rat = 0.48 g/kg
Short-term Inhalation Limits - No information.	Delayed Toxicity - No information.	

Fire

Fire Extinguishing Agents: Use alcohol foam or carbon dioxide. Water or foam may cause frothing.
Behaviour in Fire: No information.

Ignition Temperature: 477°C.	**Burning Rate:** 1.4 mm/min.

Reactivity

With Water: Reacts, forming maleic acid.
With Common Materials: Can react with oxiding materials. Reacts violently with alkaline metals, amines, calcium hydroxide, lithium, potassium, potassium hydroxide, pyridine, sodium and sodium hydroxide.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 150 ppm/24 h/sunfish/TLm/freshwater; 240 mg/L/24 to 96 h/mosquito fish/TLm/freshwater; BOD: 40 to 60%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

CORROSIVE. Combustible.

Immediate Responses

Keep non-involved people away from spill site. Issue warning "CORROSIVE". Call Fire Department. Notify manufacturer or supplier. Notify environmental authorities.

Protective Clothing and Equipment

In fires or confined spaces, Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Otherwise, protective clothing as required.

Fire and Explosion

Use alcohol foam or carbon dioxide to extinguish. Water or foam may cause frothing.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if breathing has stopped (not mouth-to-mouth method); oxygen if breathing is laboured. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give conscious victim water to drink. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

MCPA $CH_3ClC_6H_3OCH_2COOH$

IDENTIFICATION

UN No. 2765
Danger Group According to Percentage of Active Substance: Group III, Liquid 35 to 100%

Common Synonyms	Observable Characteristics	Manufacturers
(4-CHLORO-O-TOLYLOXY) ACETIC ACID	Light brown solid or colourless liquids.	Ciba-Geigy Canada Ltd., Etobicoke, Ont. Chipman Inc. Stoney Creek, Ontario. Interprovincial Co-op., Saskatoon, Sask. Uniroyal Chemical, Elmira, Ontario.
Common Trade Names MCPA AMINE (A herbicide used for the control of broadleaf weeds.)		

Transportation and Storage Information		
Shipping State: Solid or liquid (formulation). **Classification:** None. **Inert Atmosphere:** No requirement. **Venting:** Open. **Pump Type:** No information.	**Label(s):** Not regulated. **Storage Temperature:** Ambient. **Hose Type:** No information.	**Grades or Purity:** Various as shown below. **Containers and Materials:** Glass bottles, cans, drums; steel.

Physical and Chemical Characteristics		
Physical State (20°C, 1 atm): Solid (technical). **Solubility** (Water): 0.083 g/100 mL (solid) (25°C). SN, EC soluble in water. **Molecular Weight:** 200.6 **Vapour Pressure:** No information. **Boiling Point:** No information.	**Floatability** (Water): Sinks; SN and EC mix. **Odour:** No information. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** 1.56 (25°C) technical.	**Colour:** Colourless (liquids); light brown (solid). **Explosive Limits:** Not flammable. **Melting Point:** 99 to 107°C (technical).

HAZARD DATA

Human Health

Symptoms: Ingestion and Skin Contact: readily absorbed by skin; burning pain, abdominal pain, flushing of skin, vomiting, muscular tremors, abnormal temperature, lethargy and muscular weakness.
Toxicology: Highly toxic by skin contact; moderately toxic by ingestion.

TLV® No information.	LC_{50} - No information.	LD_{50} - Oral: rat = 0.70 g/kg
Short-term Inhalation Limits - No information.	Delayed Toxicity - No information.	LD_{50} - Oral: mouse = 0.55 g/kg

Fire

Fire Extinguishing Agents: Use foam, carbon dioxide, or dry chemical.
Behaviour in Fire: Releases toxic fumes.
Ignition Temperature: No information. **Burning Rate:** No information.

Reactivity

With Water: No reaction.
With Common Materials: No information.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating = 10 to 100 ppm/96 h/TLm/freshwater. Fish toxicities: bluegill/LC_{50}/freshwater; 75 mg/L/45 h/longnose killifish/LC_{50}/saltwater.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Stop or reduce discharge if safe to do so. Notify manufacturer or supplier. Dike to contain material or water runoff. Notify environmental authorities.

Protective Clothing and Equipment

In fires or confined spaces - Respiratory Protection - self-contained breathing apparatus and totally encapsulated suit. Otherwise, approved pesticide respirator and impervious outer clothing.

Fire and Explosion

Use carbon dioxide, foam or dry chemical to extinguish. Releases toxic fumes in fires.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give water to conscious victim to drink and induce vomiting; in the case of petroleum distillates, do not induce vomiting for fear of aspiration and chemical pneumonia. If medical assistance is not immediately available, transport victim to hospital, doctor, or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.

Floats

3. If possible contain discharge by booming.
4. If floating, skim and remove.

Sinks or mixes

3. If possible contain discharge by damming or water diversions.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.

5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. If liquid, remove material with pumps or vacuum equipment and place in appropriate containers.
5. If solid, remove material by manual or mechanical means.
6. Recover undamaged containers.
7. Absorb residual liquid on natural or synthetic sorbents.
8. Remove contaminated soil for disposal.
9. Notify environmental authorities to discuss cleanup and disposal of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

Available Formulations

Technical Grade: Purity: 85 to 95%.
Properties: insoluble in water.

Formulations:

Type:	Purity:	Properties:
SN - solution (diethanolamine salt)	- typically 50%	- soluble in water, combustible
SN - solution (sodium salt)	- typically 40%	- soluble in water
EC - emulsifiable concentrate (ester)	- typically 50%	- soluble in water, combustible

Other Possible Ingredients Found in Formulations: Dicamba, mecoprop, linuron, bromacil.

MCPA $CH_3ClC_6H_3OCH_2COOH$

MERCURY Hg

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
QUICKSILVER HYDRARGYRUM	Silvery liquid. Odourless.	Johnson Matthey and Mallory Ltd., Brampton, Ontario.

Transportation and Storage Information

Shipping State: Liquid.
Classification: None.
Inert Atmosphere: No requirement.
Venting: Open.
Pump Type: No information.

Label(s): Not regulated.
Storage Temperature: Ambient.
Hose Type: No information.

Grades or Purity: Pure.
Containers and Materials: Bottles, flasks, drums.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 0.025 g/100 mL (30°C).
Molecular Weight: 200.6
Vapour Pressure: 0.0012 mm Hg (20°C);
1 mm Hg (126°C).
Boiling Point: 356.6°C.

Floatability (Water): Sinks.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: 7.0
Specific Gravity: 13.6 at 20°C.

Colour: Silvery.
Explosive Limits: Not flammable.
Melting Point: -38.9°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: metallic taste, rapid and difficult breathing, coughing; Ingestion: metallic taste, intense thirst, pain in swallowing, abdominal pain, nausea and vomiting, diarrhea, trembling extremities. Contact: skin - irritation, inflammation, blisters; eyes - irritation, watering, edema of eyelids.
Toxicology: Highly toxic by all routes.
TLV® (skin - Hg vapour) 0.05 mg/m^3.
Short-term Inhalation Limits - 0.15 mg/m^3 (15 min) as Hg vapour.

LC_{50} - No information.
LC_{Lo} - Inhalation: rabbit = 29 mg/m^3/30 h
Delayed Toxicity - Known long-term effects to central nervous system.

LD_{50} - No information.
TD_{Lo} - Intraperitoneal: rat = 0.4 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used on fires involving mercury.
Behaviour in Fire: Vapourizes readily emitting toxic Hg fumes.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: No reaction.
With Common Materials: Reacts violently with acetylene, ammonia, chlorine, chlorine dioxide, methyl azide and sodium carbide.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. Fish toxicity: 0.075 mg/m^3/48 h/prawn/LC_{50}/saltwater; 5.7 mg/m^3/48 h/shrimp/LC_{50}/saltwater; EPA criterion = 0.064 µg/L/24 h/freshwater; EPA criterion = 0.025 µg/L/24 h/saltwater; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: Most biota are known to concentrate mercury.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Notify manufacturer or supplier. Dike to contain spill. Notify environmental authorities.

Protective Clothing and Equipment

In fires or confined spaces, Respiratory protection - self-contained breathing apparatus and totally encapsulated suit.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used on fires involving mercury. Vapourizes readily emitting toxic Hg fumes.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if necessary. Contact: skin - remove contaminated clothing and wash affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give water or milk to conscious victim to drink, and induce vomiting. If medical assistance is not immediately available, transport victim to doctor, clinic or hospital.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material by manual or mechanical means.
5. Absorb residual liquid on natural or synthetic sorbents.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

METHANE CH_4

IDENTIFICATION

UN No. 1971 - gas
1972 - liquid

Common Synonyms	Observable Characteristics	Manufacturers
MARSH GAS SEWAGE GAS NATURAL GAS* METHYL HYDRIDE *Natural gas is mostly methane, but contains other gases.	Colourless or liquid. Odourless when pure (commercial forms may have odour compounds added).	Canadian supplier: Canadian Liquid Air Co. Ltd., Montreal, Que.

Transportation and Storage Information

Shipping State: Liquid (compressed gas). **Classification:** Flammable gas. **Inert Atmosphere:** No requirement. **Venting:** Safety relief. **Pump Type:** No information.	**Label(s):** Red label - FLAMMABLE GAS; Class 2.1. **Storage Temperature:** Ambient. **Hose Type:** No information.	**Grades or Purity:** Technical, 95%, Btu grade. **Containers and Materials:** Cylinders, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas. **Solubility** (Water): 0.0024 g/100 mL (20°C). **Molecular Weight:** 16.0 **Vapour Pressure:** Gas. **Boiling Point:** -161.5°C.	**Floatability** (Water): Floats and boils (liquid). **Odour:** Odourless. **Flash Point:** -188°C. **Vapour Density:** 0.42 to 0.56 **Specific Gravity:** (Liquid) 0.42 (-164°C).	**Colour:** Colourless. **Explosive Limits:** 5.0 to 15.0%. **Melting Point:** -182 to -184°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: asphyxiation, dizziness, difficult breathing, nausea and vomiting, exhaustion, loss of consciousness, convulsions. Contact: skin - feeling of intense cold, frostbite; eyes - stinging pain, watering of eyes, inflammation.
Toxicology: Asphyxiant.

TLV® simple asphyxiant. Short-term Inhalation Limits - No information.	LC_{50} - Man: tolerance limit = 1 000 ppm (18 mg/m^3). Delayed Toxicity - None known.	LD_{50} - No information.

Fire

Fire Extinguishing Agents: Shut off flow of gas if safe to do so. In case of fire use carbon dioxide or dry chemical to extinguish.
Behaviour in Fire: Flash back may occur along vapour trail.

Ignition Temperature: 537°C.	**Burning Rate:** 12.5 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Reacts with strong oxidizers. Reacts violently with bromine pentafluoride, chlorine, chlorine dioxide, liquid oxygen, nitrogen trifluoride, oxygen difluoride.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Not seriously harmful to aquatic life. BOD: 304% (35 days).
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Contact supplier for advice. Eliminate all sources of ignition. Stop or reduce discharge if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - in fires, use self-contained breathing apparatus. Otherwise: Gloves - rubber or plastic. Coveralls or acid suit - (jacket and pants).

Fire and Explosion

Shut off flow of gas if safe to do so. Use carbon dioxide or dry chemical to extinguish. Flash back may occur along vapour trail.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if breathing has stopped; oxygen if breathing is laboured. Contact: (liquified methane) skin and eyes - treat as for frostbite; remove contaminated clothing and wash eyes and skin thoroughly with plenty of water. If medical assistance is not immediately available, transport victim to hospital, clinic or doctor.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water-Land-Air
1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

METHANOL CH_3OH

IDENTIFICATION

UN No. 1230

Common Synonyms	Observable Characteristics	Manufacturers
METHYL ALCOHOL WOOD ALCOHOL WOOD NAPHTHA WOOD SPIRIT CARBINOL METHYL HYDROXIDE	Clear colourless, liquid. Alcohol-like odour.	Alberta Gas Chemical, Medicine Hat, Alta. Celanese Canada, Cornwall, Ontario.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable, poisonous liquid.
Inert Atmosphere: No requirement.
Venting: Open (flame arrester) or pressure-vacuum.
Pump Type: No information.

Label(s): Red and white label - FLAMMABLE; Class 3.2, Group II. Black and white label - POISON; Class 6.1, Group II.
Storage Temperature: Ambient.
Hose Type: No information.

Grades or Purity: Pure, 99.9%; crude.
Containers and Materials: Cans, drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): Soluble in all proportions.
Molecular Weight: 32.0
Vapour Pressure: 92 mm Hg (20°C); 160 mm Hg (30°C).
Boiling Point: 64.5°C.

Floatability (Water): Floats and mixes.
Odour: Alcohol-like.
Flash Point: 11°C (c.c.).
Vapour Density: 1.1
Specific Gravity: 0.79 at 20°C.

Colour: Colourless.
Explosive Limits: 6.0% to 36.0%.
Melting Point: -93 to -98°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: asphyxia, headache, fatigue, nausea and vomiting, exhaustion, loss of consciousness, convulsions. Contact: skin - readily absorbed producing symptoms similar to inhalation; eyes - irritation, damage, blurred vision. Ingestion: headache, fatigue, nausea and vomiting, blindness and death.
Toxicology: Low toxicity by contact; moderate by inhalation.

TLV® - (skin) 200 ppm; 260 mg/m^3.
Short-term Inhalation Limits - 250 ppm; 310 mg/m^3 (15 min).

LC_{50} - No information.
TC_{Lo} - Inhalation: human = 86 000 mg/m^3
Delayed Toxicity - None known.

LD_{50} - Oral: rat = 13 g/kg

Fire

Fire Extinguishing Agents: Use alcohol foam. Water may be ineffective.
Behaviour in Fire: Flashback may occur along vapour trail.
Ignition Temperature: 385°C.
Burning Rate: 1.7 mm/min.

Reactivity

With Water: No reaction; soluble.
With Common Materials: Can react vigorously with oxidizing agents. Reacts violently with chromic anhydride, lead perchlorite, perchloric acid, phosphorus trioxide, and (hydroxides and chloroform).
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 13 680 ppm/96 h/rainbow trout fingerling/LC_{50}/freshwater; 1 700 ppm/96 h/brown shrimp/LC_{50}/saltwater; 17 000 ppm/24 h/creek chub/LC_{100}/freshwater; BOD: 48 to 124%; 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE. POISON.

Immediate Responses

Keep non-involved people away from spill site. Issue warnings: "FLAMMABLE; POISON". CALL FIRE DEPARTMENT. Eliminate all sources of ignition. Notify manufacturer. Stop leak, if safe to do so. Dike to contain material. Notify environmental authorities.

Protective Clothing and Equipment

Protective outerwear as required.

Fire and Explosion

Use alcohol foam to extinguish; water may be ineffective. Flash back may occur along vapour trail.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing, and flush affected aras with plenty of water; eyes - irrigate with plenty of water. Ingestion: give plenty of water to conscious victim to drink and induce vomiting. If medical assistance is not immediately available, transport victim to doctor, hospital or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

METHYL ACRYLATE $CH_2{:}CHCOOCH_3$

IDENTIFICATION

UN No. 1919

Common Synonyms	Observable Characteristics	Manufacturers
ACRYLIC ACID, METHYL ESTER METHYL 2-PROPENOATE METHYL PROPENATE PROPENOIC ACID, METHYL ESTER	Colourless liquid. Sweet, sharp odour.	No Canadian manufacturers. Celanese Chem. Co., New York, NY. Rohm and Haas Co., Philadelphia, PA.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable liquid.
Inert Atmosphere: Air must be present.
Venting: Open (flame arrester).
Pump Type: No information.

Label(s): Red and white label - FLAMMABLE LIQUID; Class 3.2, Group II.
Storage Temperature: Ambient (if inhibited, <4°C if no inhibiter).
Hose Type: No information.

Grades or Purity: Technical 98.5% (minimum purity); 99.9% (with inhibitor; hydroquinone and its methyl ether, in presence of air).
Containers and Materials: Drums, tank cars; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 5.2 g/100 mL (20°C).
Molecular Weight: 86.1
Vapour Pressure: 70 mm Hg (20°C); 110 mm Hg (30°C).
Boiling Point: 80 to 81°C.

Floatability (Water): Floats.
Odour: Sweet, sharp.
Flash Point: -3°C (o.c.).
Vapour Density: 3.0
Specific Gravity: 0.96 (20°C).

Colour: Colourless.
Explosive Limits: 2.8 to 25%.
Melting Point: -76.5°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of mucous membranes, headache, nausea, cyanosis, dizziness, fatigue, diarrhea. Ingestion: irritation of lips, mouth and throat, pain in swallowing, stomach and abdominal pain, nausea and vomiting, diarrhea, shock, convulsions. Contact: skin - readily absorbed, itching and irritation, inflammation, blisters; eyes - irritation, watering of eyes, inflammation, chemical burns and lesions.
Toxicology: Highly toxic by inhalation and ingestion; moderately toxic by contact.

TLV® (skin) 10 ppm; 35 mg/m^3.
Short-term Inhalation Limits - No information.

LC_{50} - No information.
LC_{Lo} - Inhalation: rat = 1 000 ppm/4 h
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 0.3 g/kg

Fire

Fire Extinguishing Agents: Foam, dry chemical or carbon dioxide. Water may be ineffective but should be used to keep fire-exposed containers cool and disperse vapours.
Behaviour in Fire: At temperatures above 21°C polymerization may take place, and if in a closed container, may cause a violent rupture. Flash back may occur along vapour trail.
Ignition Temperature: 468°C.

Burning Rate: No information.

Reactivity

With Water: No reaction; slightly soluble.
With Common Materials: Can react vigorously with oxidizing agents.
Stability: Polymerizes at high temperatures or under certain conditions.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. Aquatic toxicity rating = 100 to 1 000 ppm/96 h/TLm/freshwater.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE. Polymerizes under certain conditions.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all sources of ignition. Notify manufacturer or supplier. Dike to prevent runoff of material. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit.

Fire and Explosion

Use foam, dry chemical or carbon dioxide to extinguish. Water may be ineffective, but should be used to cool fire-exposed containers and disperse vapours. At temperatures above 21°C, polymerization may take place and, if in a closed container, violent rupture may occur. Flash back may occur along vapour trail.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing, and flush affected area with plenty of water; eyes - irrigate with plenty of water. Ingestion: give plenty of water to conscious victim to drink and induce vomiting. If medical assistance is not immediately available, transport victim to doctor, hospital or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

Dissolved

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Undissolved

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain spill by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

METHYLAMINES

IDENTIFICATION

UN No. 1061 Anhydrous
1235 Aqueous solution

Common Synonyms	Observable Characteristics	Manufacturers
MONOMETHYLAMINE (CH_3NH_2) Aminomethane, Carbinamine DIMETHYLAMINE $(CH_3)_2NH$ TRIMETHYLAMINE $(CH_3)_3N$ Methanamine, N,N-Dimethylamine	Colourless gases or liquids. Ammonia-like odours.	Chinook Chemicals, Sombra, Ontario.

Transportation and Storage Information

Shipping State: Liquid (compressed gas or aqueous solution).
Classification: Flammable liquid or gas.
Inert Atmosphere: No requirement.
Venting: Safety relief.

Label(s): Red label - FLAMMABLE LIQUID OR GAS.
Storage Temperature: Ambient.

Grades or Purity: Anhydrous, 96.5%+; aqueous solutions 25, 30, 35, 40%.
Containers and Materials: Anhydrous - cylinders. Solutions - drums, tank cars, tank trucks; steel, stainless steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas.
Solubility (Water): Soluble in all proportions.
Molecular Weight: 31.1 (mono); 45.1 (di; 59.1 (tri).
Vapour Pressure: (mono) 2 356 mm Hg; (di) 1 292 mm Hg; (tri) 1 444 mm Hg (all at 20°C).
Boiling Point: (mono) -6.5°C; (di) 7.4°C; (tri) 2.9°C.
Specific Gravity: (mono) 0.77 (-70°C); (di) 0.68 (0°C); (tri) 0.66 (-5°C) (anhydrous forms).
Solutions: 25% (mono) 0.93 (15°C); 40%, 0.89 (15°C). 25% (di) 0.92 (15°C); 40%, 0.88 (15°C). 25% (tri) 0.92 (15°C); 40% 0.89 (15°C).

Floatability (Water): Liquid or solutions float and mix.
Odour: Ammonia-like, fishy (0.02 to 3.3 ppm, odour threshold).
Flash Point: gases <0°C. 30% (mono) solution 0.28°C; 40%, -13°C. 25% (di) solution 5.6°C; 40%, -15.6°C; 25% (tri) solution 5°C (all o.c.).
Vapour Density: (mono) 1.07; (di) 1.55; (tri) 2.04.

Colour: Colourless.
Explosive Limits: 4.9 to 20.7% (mono); 2.8 to 14.4% (di); 2.0 to 11.6% (tri).
Melting Point: (anhydrous forms)(mono) -92.5°C; (di) -92 to -96°C; (tri) -177 to -124°C.
25% mono solution -31°C; 40%, -37°C. 25% di solution -17°C; 40%, -37°C. 25% tri solution +6°C; 40%, +4°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of nose and eyes, sneezing, coughing. Ingestion: burning sensation, pain in swallowing, nausea and vomiting, stomach cramps, rapid breathing, diarrhea. Contact: skin - painful burning, ulceration and shock; eyes - painful irritation, intense watering, burns and irreparable damage.
Toxicology: Moderately toxic by all routes.
TLV® - (mono) 10 ppm; 12 mg/m^3; (di) 10 ppm; 18 mg/m^3.
Short-term Inhalation Limits - No information.

LC_{50} - No information.
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 0.698 g/kg (di)
LD_{Lo} - Subcutaneous: rat = 0.20 g/kg (mono)

Fire

Fire Extinguishing Agents: Stop flow of gas. Use water spray, carbon dioxide, dry chemical and alcohol foam on water solution. Use water to cool fire-exposed containers.
Behaviour in Fire: Flash back may occur along vapour trail.
Ignition Temperature: 430°C (mono); 400°C (di); 109°C (tri).
Burning Rate: No information.

Reactivity

With Water: No reaction; soluble.
With Common Materials: Can react vigorously with oxidizing materials. Aqueous solutions are corrosive to many metals.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. Fish toxicity: (mono) 10 to 30 ppm, (di) 30 to 50 ppm/24 h/creek chub/TLm/freshwater; Aquatic toxicity rating = 10 to 100 ppm/96 h/TLm/freshwater; BOD: 130% (di), 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE. Aqueous solutions are corrosive.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all sources of ignition. Notify manufacturer or supplier. Dike to prevent runoff from water application. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit.

Fire and Explosion

Stop flow of gas. Use water spray, carbon dioxide, dry chemical or alcohol foam on water solutions. Use water to cool fire-exposed containers. Flash back may occur along vapour trail.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give conscious victim plenty of water to drink; do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

METHYL CHLORIDE CH_3Cl

IDENTIFICATION

UN No. 1063

Common Synonyms	Observable Characteristics	Manufacturers	
CHLOROMETHANE MONOCHLOROMETHANE	Colourless gas or liquid. Sweet, ethereal odour.	No Canadian manufacturer. Canadian suppliers: Domtar, Longford Mills, Ontario. Dow Chemical Canada, Inc., Sarnia, Ont. Ethyl Canada, Sarnia, Ontario.	Originating from: Conoco Chem., USA Dow Chemical, Plaquemine, LA, Freeport, TX, Ethyl, USA

Transportation and Storage Information

Shipping State: Liquefied compressed gas.
Classification: Poisonous gas and flammable liquid.
Inert Atmosphere: No requirement.
Venting: Safety relief.
Pump Type: Positive displacement; carbon steel, stainless steel.

Label(s): White label - POISONOUS GAS; Class 2.3. Red label - FLAMMABLE LIQUID; Class 3.1.
Storage Temperature: Ambient.
Hose Type: Teflon, Viton, bronze, stainless steel.

Grades or Purity: Refrigeration grade; technical grade. 99.5+%.
Containers and Materials: Cylinders, tank cars, tank trucks; steel, stainless steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas.
Solubility: Slight; 0.72 g/100 mL (0°C); 0.43 g/100 mL (25°C).
Molecular Weight: 50.5
Vapour Pressure: 3800 mm Hg (20°C); 5090 mm Hg (30°C).
Boiling Point: -24.2°C.

Floatability (Water): Floats and boils.
Odour: Faintly sweet, ether-like; (21 mg/m^3, odour threshold).
Flash Point: Below -46°C
Vapour Density: 1.8
Specific Gravity: (Liquid) 0.92 (20°C); 0.99 (-25°C).

Colour: Colourless.
Explosive Limits: 10.7 to 17.4%.
Melting Point: -97.7°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: asphyxia; headache, fatigue, mental confusion, nausea and vomiting, giddiness, exhaustion, loss of consciousness, convulsions.
Contact: skin - feeling of cold, pain, frostbite; eyes - stinging, watering, inflammation.
Toxicology: Repeated exposures which do not at once cause serious symptoms may be followed after a few days by more severe effects.

TLV® - (inhalation) 50 ppm, 105 mg/m^3.
Short-term Inhalation Limits - 100 ppm; 205 mg/m^3 (15 min).

LC_{50} - Inhalation: rat = 152 000 mg/m^3 for 30 min.
Delayed Toxicity - Sublethal or lethal effects may occur several days after exposure. Symptoms may not appear until several hours after exposure.

LD_{50} - No information.

Fire

Fire Extinguishing Agents: Do not attempt to put out fire until leak has been turned off. In fires, use dry chemical, carbon dioxide or foam. Water may be used to knock down vapours or cool fire-exposed containers.
Behaviour in Fire: Flashback may occur along vapour trail. Decomposition from heat or fire can produce toxic chloride fumes.
Ignition Temperature: 632°C.
Burning Rate: 2.2 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Can react violently with powdered aluminum, magnesium, sodium and other alkali metals.
Stability: Stable.

Environment

Water: Prevent entry into water intakes or waterways. Aquatic toxicity rating = >1 000 ppm/96 h/TLm/freshwater; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". Call Fire Department. Eliminate all sources of ignition. Call manufacturer for advice. Avoid contact and inhalation. In fire, work from upwind. If water spray used, dike area to contain toxic runoff. Stop or reduce discharge, if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus. Acid suit - jacket and pants, rubber or plastic. Boots - high, rubber; pants worn outside boots. Gloves - rubber or plastic.

Fire and Explosion

Do not attempt to put out fire until leak has been shut off. For fires, use dry chemical, carbon dioxide or foam. Use water spray to knock down vapour and cool fire-exposed containers. Flashback may occur along vapour trail. Decomposition from heat or fire can produce toxic chloride fumes.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if breathing has stopped; give oxygen if breathing is laboured. Contact: remove contaminated clothing; wash eyes and affected skin with plenty of warm water. Do not rub areas which appear to have been frostbitten. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic. Victim should be hospitalized for observation because of slowly developing symptoms.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Recover undamaged containers.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

METHYL ETHYL KETONE $CH_3COC_2H_5$

IDENTIFICATION

UN No. 1193

Common Synonyms	Observable Characteristics	Manufacturers
MEK 2-BUTANONE ETHYL METHYL KETONE	Colourless liquid. Sweet, fragrant.	Shell Canada Limited, Montreal, Que. Gulf Oil Canada Limited, Montreal, Que. Esso Chemicals, Sarnia, Ont.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable liquid.
Inert Atmosphere: No requirement.
Venting: Open (flame arrester) or pressure-vacuum.
Pump Type: Gear, centrifugal; explosion-proof motors.
Label(s): Red label - FLAMMABLE LIQUID; Class 3.2, Group II.
Storage Temperature: Ambient.
Hose Type: Polyethylene, butyl, polypropylene.
Grades or Purity: Technical, 99.5+%.
Containers and Materials: Drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 35.3 g/100 mL (10°C); 26.3 (20°C); 19.0 g/100 mL (90°C).
Molecular Weight: 72.1
Vapour Pressure: 77.5 mm Hg (20°C).
Boiling Point: 79.6°C.
Floatability (Water): Floats and mixes.
Odour: Sweet, fragrant (2.0 to 6.0 ppm, odour threshold).
Flash Point: -5.6°C (o.c.); -9.0°C (c.c.).
Vapour Density: 2.4
Specific Gravity: 0.81 (20°C).
Colour: Colourless.
Explosive Limits: 1.7 to 11.4%.
Melting Point: -85 to 87°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: coughing, shortness of breath, headache, dizziness, irritation of respiratory tract; Ingestion: irritation of digestive tract, nausea and vomiting, headache and dizziness. Contact: skin - defatting and dermatitis; eyes - irritation and burning.
Toxicology: Highly toxic by ingestion, moderately toxic by contact.
TLV* - (inhalation) 200 ppm; 590 mg/m^3.
Short-term Inhalation Limits - 300 ppm; 885 mg/m^3 (15 min).
LC_{50} - No information.
Delayed Toxicity - No information.
TC_{Lo} - Inhalation: human = 100 ppm/5 min.
LD_{50} - Oral: rat = 3.4 g/kg

Fire

Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide. Water may be ineffective, but may be used to cool fire-exposed containers.
Behaviour in Fire: Flashback may occur along vapour trail.
Ignition Temperature: 516°C.
Burning Rate: 4.1 mm/min.

Reactivity

With Water: No reaction, soluble.
With Common Materials: Can react with oxidizing materials. Reacts violently with chlorosulfonic acid, oleum and potassium-t-butoxide.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 5 640 mg/L/48 h/bluegill/TLm/freshwater; 500 mg/L/24 h/goldfish/LC_{50}/freshwater; 5 600 mg/L/48 h/mosquito fish/TLm/freshwater; Aquatic toxicity rating = >1 000 ppm/96 h/TLm/freshwater; BOD: 151 to 224%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all ignition sources. Call manufacturer or supplier for advice. Contain spill by diking. Prevent runoff into sewers or watercourses. Avoid inhalation or contact. Stop or reduce discharge, if safe to do so. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus, and full protective clothing. Gloves - rubber. Boots - high, rubber (pants worn outside boots).

Fire and Explosion

Use dry chemical, alcohol foam or carbon dioxide to extinguish. Water may be ineffective, but may be used to cool fire-exposed containers. Flash back may occur along vapour trail.

First Aid

Move victim out of spill area, to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: eyes - irrigate with plenty of water; skin - wash affected areas with plenty of water and remove contaminated clothing. Ingestion: give plenty of water to conscious victim to drink and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

METHYLCYCLOPENTADIENYL MANGANESE TRICARBONYL $C_9H_7O_3Mn$

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
METHYLCYCLOPENTADIENYLMANGANESE-TRICARBONYL ETHYL MMT ANTIKNOCK MMT	Orange liquids. Sensitive to light. Faint, pleasant, herbaceous odour.	Ethyl Corporation of Canada Limited, Corunna, Ontario; Toronto, Ontario. U.S. manufacturer: Ethyl Corporation, Houston, TX

Transportation and Storage Information

Shipping State: Liquid.
Classification: Not regulated. Voluntary poison label.
Inert Atmosphere: No requirement.
Venting: Pressure-vacuum.
Pump Type: Standard types (e.g. centrifugal). For LP grades, flammable solvent equipment required.

Label(s): Voluntary white label - POISON.
Storage Temperature: Ambient.
Hose Type: Standard neoprene hydrocarbon hose. Also flexible stainless steel, steel, Teflon.

Grades or Purity: Ethyl MMT (neat), Ethyl MMT/LP 62, Ethyl MMT/LP 46.
Containers and Materials: Cans, drums; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 0.007 g/100 mL (25°C).
Molecular Weight: 218.1
Vapour Pressure: 0.051 mm Hg (20°C); 9.3 mm Hg (100°C).
Boiling Point: 233°C (for neat MMT).

Floatability (Water): Sink.
Odour: Faint, pleasant, herbaceous.
Flash Point: Ethyl MMT, 96°C (c.c.); Ethyl MMT/LP 62, 90°C (c.c.); Ethyl MMT/LP 46, 65°C (c.c.)
Vapour Density: No information.
Specific Gravity: Ethyl MMT, 1.38 at 20°C; Ethyl MMT/LP 62-1.11; Ethyl MMT/LP 46-1.02.

Colour: Dark orange.
Explosive Limits: Not determined for neat MMT; solvents in other grades may be explosive.
Melting Point: -2.2 to 1.5°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: difficulty breathing, headache, metallic taste, nausea. Ingestion: symptoms similar to inhalation. Contact: skin - readily absorbed; eyes - irritation.
Toxicology: Highly toxic by inhalation and ingestion; moderately toxic by contact.
TLV® - (skin) 0.2 mg/m^3 (as Mn).
Short-term Inhalation Limits - 0.6 mg/m^3 (15 min) (as Mn).
LC_{50} - (Inhalation) rat = 247 mg/m^3/1 h
Delayed Toxicity - No information.
LD_{50} - Oral: rat = 0.058 g/kg

Fire

Fire Extinguishing Agents: Dry chemical, carbon dioxide, foam, water spray.
Behaviour in Fire: Decomposes slowly at 200°C; fairly rapidly at 300°C yielding toxic gases.
Ignition Temperature: No information.
Burning Rate: No information.

Reactivity

With Water: No reaction.
With Common Materials: No information.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. BOD: No information.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

POISON. FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warnings: "POISON; FLAMMABLE". Call fire department. Eliminate all ignition sources. Call manufacturer for guidance and assistance. Stop or reduce discharge, if this can be done without risk. Avoid contact and inhalation. Contain spill area by diking. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - use self-contained breathing apparatus and totally encapsulated suit. Gloves - neoprene or vinyl. Boots - rubber (pants worn outside boots).

Fire and Explosion

Use dry chemical, carbon dioxide, foam or water spray to extinguish.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: If breathing has stopped give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: eyes irrigate with plenty of water; skin - flush with plenty water and remove contaminated clothing. Ingestion: give conscious victim plenty of water to drink and induce vomiting. Keep victim warm and quiet. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Absorb residual liquid on natural or synthetic sorbents.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

METHYLENE CHLORIDE CH_2Cl_2

IDENTIFICATION

UN No. 1593

Common Synonyms	Observable Characteristics	Manufacturers
DICHLOROMETHANE METHYLENEDICHLORIDE METHANE DICHLORIDE	Colourless liquid. Ethereal odour.	No Canadian manufacturers. Canadian supplier: Dow Chemical Canada Inc., Sarnia, Ontario. Stanchem, Montreal, Quebec. Originating from: PPG Industries, USA

Transportation and Storage Information

Shipping State: Liquid.
Classification: Poison.
Inert Atmosphere: No requirement.
Venting: Pressure-vacuum.
Pump Type: Centrifugal or positive displacement; steel or stainless steel.

Label(s): Black and white label - POISON; Class 6.1, Group III.
Storage Temperature: Ambient.
Hose Type: Stainless stee; Teflon, bronze. Viton or cross-linked polyethylene may be used with caution.

Grades or Purity: Technical.
Containers and Materials: Drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility: 2.0 g/100 mL (20°C); 1.67 g/100 mL (25°C).
Molecular Weight: 84.9
Vapour Pressure: 349 mm Hg (20°C); 500 mm Hg (30°C).
Boiling Point: 39 to 41°C.

Floatability (Water): Sinks.
Odour: Ethereal (25 to 220 ppm, odour threshold).
Flash Point: Not flammable.
Vapour Density: 2.9
Specific Gravity: 1.33 (20°C).

Colour: Colourless.
Explosive Limits: 12 to 22%.
Melting Point: -96.7°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of respiratory tract, headache, dizziness, nausea, unconsciousness; Ingestion: abdominal pain, readily absorbed producing symptoms similar to inhalation. Contact: skin - readily absorbed with symptoms similar to inhalation; eyes - irritation, slight burns.
Toxicology: Moderately toxic by all routes.
TLV® - (inhalation) 100 ppm; 350 mg/m^3.
Short-term Inhalation Limits - 500 ppm; 1 400 mg/m^3 (15 min).

LC_{50} - Inhalation: rat = 88 000 mg/m^3/0.5 h
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 1.67 g/kg

Fire

Fire Extinguishing Agents: Most fire extinguishing agents may be used on fires involving methylene chloride, including water spray or fog and foam. Water may be used to cool fire-exposed containers.
Behaviour in Fire: When heated to decomposition, emits toxic fumes of hydrogen and chloride.
Ignition Temperature: 556°C.
Burning Rate: No information.

Reactivity

With Water: No reaction.
With Common Materials: Reacts violently with lithium, sodium/potassium alloy and potassium-t-butoxide. May react with aluminum, magnesium and their alloys.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating = 100 to 1 000 ppm/96 h/TLm/freshwater; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "POISON". Call Fire Department. Call manufacturer for assistance. Avoid contact and inhalation. Dike to prevent runoff. Notify environmental authorities.

Protective Clothing and Equipment

In fires or enclosed spaces, Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Otherwise, suitable respirator and protective outerwear as required.

Fire and Explosion

Most fire extinguishing agents may be used on fires involving methylene chloride. Water may be used to cool fire-exposed containers. When heated to decomposition, emits toxic fumes of hydrogen and chloride.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water for at least 15 minutes. Ingestion: give plenty of water to drink. Do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge is safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Adsorb residual liquid on natural or synthetic sorbents.
7. Remove contaminated soil for disposal.
8. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

METHYL ISOBUTYL KETONE $(CH_3)_2CHCH_2COCH_3$

IDENTIFICATION

UN No. 1245

Common Synonyms

HEXONE
4-METHYL-2-PENTANONE
ISOBUTYL METHYL KETONE
MIBK
2-METHYL-4-PENTANONE

Observable Characteristics

Colourless liquid. Sharp, pleasant odour.

Manufacturers

Shell Canada, Montreal, Quebec.
Gulf Canada, Montreal, Quebec.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable liquid.
Inert Atmosphere: No requirement.
Venting: Open (flame arrester) or pressure-vacuum.
Pump Type: Gear, centrifugal; explosion-proof motors.

Label(s): Red and white label - FLAMMABLE LIQUID; Class 3.2, Group II.
Storage Temperature: Ambient.
Hose Type: Polyethylene, butyl, polypropylene.

Grades or Purity: Technical, 98.5%.
Containers and Materials: Cans, drums, tank cars; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 1.8 g/100 mL (20°C).
Molecular Weight: 100.2
Vapour Pressure: 6 mm Hg (20°C); 10 mm Hg (30°C).
Boiling Point: 116 to 119°C.

Floatability (Water): Floats.
Odour: Sharp, pleasant (0.1 to 7.8 ppm).
Flash Point: 18°C (c.c.).
Vapour Density: 3.5
Specific Gravity: 0.80 (20°C).

Colour: Colourless.
Explosive Limits: 1.2 to 8.0%.
Melting Point: -80 to -85°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of respiratory tract, headache, nausea, dizziness, unconsciousness, CNS depressant. Ingestion: irritation of gastrointestinal tract, nausea and vomiting. Contact: skin - defatting and irritation; eyes - irritation and burning sensation.
Toxicology: Moderately toxic by all routes.
TLV® (inhalation) 50 ppm; 205 mg/m^3.
Short-term Inhalation Limits - 75 ppm; 300 mg/m^3 (15 min).

LC_{50} - No information.
Delayed Toxicity - No information.
LC_{Lo} - **Inhalation:** rat = 4 000 ppm/15 min.

LD_{50} - **Oral:** rat = 2.08 g/kg

Fire

Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide. Water may be ineffective, but may be used to cool fire-exposed containers.
Behaviour in Fire: Flash back may occur along vapour trail.
Ignition Temperature: 448°C.

Burning Rate: No information.

Reactivity

With Water: No reaction.
With Common Materials: Can react vigorously with reducing or oxidizing materials. Reacts violently with potassium-t-butoxide.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating = >1 000 ppm/96 h/TLm/freshwater; Fish toxicity: 460 mg/L/24 h/goldfish/ LC_{50}/freshwater; BOD: 12 to 60%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning "FLAMMABLE". CALL FIRE DEPARTMENT. Call manufacturer for assistance. Dike to prevent runoff. Call environmental authorities.

Protective Clothing and Equipment

In fires Respiratory protection - self-contained breathing apparatus. Otherwise, suitable respirator and outer protective clothing as required.

Fire and Explosion

Use alcohol foam, dry chemical or carbon dioxide to extinguish. Water may be ineffective, but may be used to cool fire-exposed containers. Flash back may occur along vapour trail.

First Aid

Move victim out of spill site. Call for medical assitance but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give conscious victim plenty of water to drink. If medical assistance is not immediately available, transport victim to doctor, hospital or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

METHYL MERCAPTAN CH_3SH

IDENTIFICATION

UN No. 1064

Common Synonyms	Observable Characteristics	Manufacturers
METHANETHIOL MERCAPTOMETHANE (Methyl mercaptan is frequently added to natural gas to provide odour).	Colourless gas. Strong unpleasant (rotten cabbage) odour.	Canadian supplier: Canadian Liquid Air Co. Ltd., Montreal, Que.

Transportation and Storage Information

Shipping State: Liquid (compressed gas). **Classification:** Flammable gas. **Inert Atmosphere:** No requirement. **Venting:** Safety relief.	**Label(s):** Red label - FLAMMABLE GAS; Class 3. White label - POISON; Class 2.3. **Storage Temperature:** Ambient.	**Grades or Purity:** 98.0% purity; 99.5+% reagent. **Containers and Materials:** Cylinders, tank cars; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas. **Solubility (Water):** 2.4 g/100 mL (15°C). **Molecular Weight:** 48.1 **Vapour Pressure:** 760 mm Hg (6.8°C); 1 520 mm Hg (26°C); 3 800 mm Hg (60°C). **Boiling Point:** 6 to 7.6 °C.	**Floatability (Water):** Floats and boils. **Odour:** Strongly unpleasant (rotten cabbage), (0.001 to 0.002 ppm, odour threshold). **Flash Point:** -17.8°C. **Vapour Density:** 1.7 **Specific Gravity:** 0.87 (21°C) (liquid).	**Colour:** Colourless. **Explosive Limits:** 3.9 to 21.8%. **Melting Point:** -123°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritating to respiratory tract; may cause dizziness, suffocation, headache and vomiting; CNS depressant, muscular weakness, tremors, unconsciousness and respiratory paralysis. Contact: skin and eyes - irritation and frostbite.
Toxicology: Moderately toxic by inhalation.

TLV® (inhalation) 0.5 ppm; 1 mg/m^3. Short-term Inhalation Limits - No information.	LC_{50} - Inhalation: rat = 675 ppm Delayed Toxicity - No information.	LD_{50} - Subcutaneous: mouse = 0.0024 g/kg

Fire

Fire Extinguishing Agents: Alcohol foam, carbon dioxide, dry chemical. Water may be used to cool fire-exposed containers and knock down vapours.
Behaviour in Fire: Emits highly toxic SO_x fumes in high temperatures. Flash back may occur along vapour trail.

Ignition Temperature: No information.	**Burning Rate:** 3.8 mm/min.

Reactivity

With Water: Reacts with water to produce toxic SO_x fumes.
With Common Materials: Can react vigorously with oxidizing materials. Reacts with acids to produce toxic and flammable SO_x vapours.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways; toxic to aquatic life. Fish toxicity: 1.0 ppm/120 h/Daphnia sp./TLm/freshwater; 0.55 to 0.9 mg/L/Salmonides/TLm/freshwater.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE; POISON.

Immediate Responses

Keep non-involved people away from spill site. Issue warnings: "FLAMMABLE; POISON". CALL FIRE DEPARTMENT. Eliminate all sources of ignition. Contact supplier and request advice or assistance. Avoid contact and inhalation. Stop or reduce discharge, if safe to do so. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus, and totally encapsulated suit.

Fire and Explosion

Use alcohol foam, dry chemical or carbon dioxide to extinguish fire. Use water to cool fire-exposed containers. Emits highly toxic SO_x fumes in high temperatures. Flash back may occur along vapour trail.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if breathing has stopped (not mouth-to-mouth method); and oxygen if breathing is laboured. Contact: remove contaminated clothing and wash eyes and skin thoroughly with plenty of warm water. Keep victim warm and quiet. If medical assistance is not immediately available, transport victim to hospital, clinic or doctor.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Recover undamaged containers.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

METHYL METHACRYLATE $CH_2{:}C(CH_3)COOCH_3$

IDENTIFICATION

UN No. 1247 (monomer, inhibited)

Common Synonyms	Observable Characteristics	Manufacturers	
METHACRYLIC ACID, METHYL ESTER METHYL-α-METHACRYLATE METHYL 2-METHYL-2-PROPENOATE MME METHACRYLATE MONOMER	Colourless liquid. Sharp, sweet odour.	No Canadian manufacturers. Canadian suppliers: Chemacryl Plastics, Niagara Falls, Ont. DuPont, Canada, Toronto, Ontario. Rohm & Haas Canada, Toronto, Ontario.	Originating from: Cy-Ro Industries, USA El duPont de Nemours, USA Rohm & Haas, USA

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable liquid.
Inert Atmosphere: No requirement.
Venting: Pressure-vacuum.
Pump Type: No information.

Label(s): Red and white label - FLAMMABLE LIQUID; Class 3.2, Group II.
Storage Temperature: Ambient.
Hose Type: No information.

Grades or Purity: Technical (inhibited: hydroquinone 22 to 65 ppm; hydroquinone methyl ester 22 to 120 ppm; dimethyl-t-butylphenol 45 to 65 ppm).
Containers and Materials: Drums, tank cars, trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 1.5 g/100 mL (25°C).
Molecular Weight: 100.1
Vapour Pressure: 28 mm Hg (20°C); 40 mm Hg (26°C); 49 mm Hg (30°C).
Boiling Point: 100 to 101°C.

Floatability (Water): Floats.
Odour: Sharp, sweet, (0.05 to 0.21 ppm).
Flash Point: 10°C (o.c.).
Vapour Density: 3.5
Specific Gravity: 0.94 (20°C).

Colour: Colourless.
Explosive Limits: 1.7 to 8.2%.
Melting Point: -48 to -50°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: headache, drowsiness, nausea, irritability, narcosis. Contact: skin - irritation and dermatitis; eyes - irritation.
Toxicology: Moderately toxic by all routes.
TLV® 100 ppm; 410 mg/m^3.
Short-term Inhalation Limits - 125 ppm; 510 mg/m^3 (15 min).
LC_{50} - Inhalation: rat = 3 750 ppm
Delayed Toxicity - No information.
LD_{50} - Oral: guinea pig = 6.3 g/kg

Fire

Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical. Water may be ineffective but may be used to cool fire-exposed containers and knock down vapours.
Behaviour in Fire: Flash back may occur along vapour trail. At high temperatures (as in fire) polymerization may occur and cause container rupture.
Ignition Temperature: 421°C.
Burning Rate: 2.5 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Can react with oxidizing materials. Reacts violently with benzoyl peroxide.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. Fish toxicity: 232 to 368 mg/L/24 to 96 h/bluegill/TLm/freshwater; Aquatic toxicity rating = 100 to 1 000 ppm/96 h/TLm/freshwater; BOD: 14%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all sources of ignition. Contact manufacturer for assistance. Dike to prevent runoff. Notify environmental authorities.

Protective Clothing and Equipment

In fires, Respiratory protection - self-contained breathing apparatus; and protective outerwear as required.

Fire and Explosion

Foam, carbon dioxide or dry chemical. Water may be ineffective but may be used to cool fire-exposed containers and knock down vapours. Flash back may occur along vapour trail. At high temperatures (as in fire) polymerization may occur and cause container rupture.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected area with plenty of water; eyes - irrigate with plenty of water. Ingestion: give conscious victim plenty of water to drink and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

MORPHOLINE $OCH_2CH_2NHCH_2CH_2$

IDENTIFICATION

UN No. 2054

Common Synonyms	Observable Characteristics	Manufacturers	
DIETHYLENIMIDE OXIDE TETRAHYDRO-2H-1,4-OXAZINE TETRAHYDRO-p-ISOXAZINE TETRAHYDRO-1,4-OXAZINE TETRAHYDRO-1,4-ISOXAZINE	Colourless, oily liquid with fishy ammonia odour.	Canadian supplier: Canadian Industries Ltd., Toronto, Ont. McArthur Chemical, Montreal, Ont. Texaco Chemical Canada, Toronto, Ont. BASF Canada, Montreal, Quebec. Kingsley and Keith, Montreal, Quebec.	Originating from: Texaco, United Kingdom. BASF, W. Germany. Chemische Werke Huls, W. Germany.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable liquid.
Inert Atmosphere: No requirement.
Venting: Open.
Pump Type: No information.

Label(s): Red and white label - FLAMMABLE LIQUID; Class 3.3, Group II.
Storage Temperature: Ambient.
Hose Type: No information.

Grades or Purity: Technical, 98%.
Containers and Materials: Drums, tank cars; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): Soluble in all proportions.
Molecular Weight: 87.1
Vapour Pressure: 4.3 mm Hg (10°C); 8.0 mm Hg (20°C); 13.4 mm Hg (30°C).
Boiling Point: 127 to 129°C.

Floatability (Water): Mixes.
Odour: Fishy (0.01 to 0.14 ppm, odour threshold).
Flash Point: 38°C (o.c.).
Vapour Density: 3.0
Specific Gravity: 1.00 at 20°C (liquid).

Colour: Colourless.
Explosive Limits: 2.0 to 11.2%.
Melting Point: -3 to -5°C.

HAZARD DATA

Human Health

Symptoms: Contact: liquid causes skin and eye burns, readily absorbed by skin. Inhalation: vapours may cause nausea, headache and irritation to respiratory tract. Ingestion: abdominal pain, diarrhea, vomiting.
Toxicology: Highly toxic by skin absorption and moderately toxic by ingestion.
TLV® (skin) 20 ppm; 70 mg/m^3.
Short-term Inhalation Limits - 30 ppm; 105 m g/m^3 (15 min).

LC_{50} - **Inhalation:** mouse = 1 320 mg/m^3.
Delayed Toxicity - May produce liver and kidney damage.

LD_{50} - Oral: rat = 1.05 g/kg

Fire

Fire Extinguishing Agents: Water spray, alcohol foam, dry chemical or carbon dioxide. Use water to cool fire-exposed containers and disperse vapours.
Behaviour in Fire: Flash back may occur along vapour trail. In fires, toxic NO_x fumes are produced.
Ignition Temperature: 310°C.
Burning Rate: 1.9 mm/min.

Reactivity

With Water: No reaction, soluble.
With Common Materials: Can react with oxidizing materials.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating = 100 to 1 000 ppm/96 h/TLm/freshwater; 300 ppm/96 h/bluegill/TL_{50}/freshwater; BOD: 2%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all sources of ignition. Avoid contact and inhalation. Call manufacturer or supplier. Dike to prevent runoff. Call environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit.

Fire and Explosion

Use water spray, alcohol foam, dry chemical or carbon dioxide to extinguish fire. Water may be used to cool fire-exposed containers and knock down vapours. Flash back may occur along vapour trail. In fires, toxic NO_x fumes are produced.

First Aid

Move victim out of spill area. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected area with plenty of water; eyes - irrigate with plenty of water. Ingestion: give plenty of water to conscious victim to drink. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

NAPHTHA SOLVENT

IDENTIFICATION

UN No. 1255 - petroleum
1256 - solvent
1300 - V, M&P

Common Synonyms

PETROLEUM SOLVENT
PETROLEUM ETHER
PETROLEUM SPIRITS
DRY CLEANERS NAPHTHA
LIGHT NAPHTHA
BENZIN
MINERAL SPIRITS
IOSOL
LIGHT LIGROIN
CLEANING SOLVENTS
SAFETY SOLVENT
WHITE SPIRITS

Naphtha: A generic term applied to refined, partly refined, or unrefined, petroleum products and liquid products of natural gas which distill between the temperatures of 35 and 205°C.

Observable Characteristics

Colourless liquid. Gasoline-like odour.

Manufacturers

Esso Chemical Canada,
Div. of Imperial Oil Ltd.,
Sarnia, Ont.
Gulf Oil Canada Ltd.,
Montreal, Que.
Shell Canada Limited,
Montreal, Que.; Sarnia, Ont.;
North Burnaby, B.C.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable liquid.
Inert Atmosphere: No requirement.
Venting: Open (flame arrester) or pressure-vacuum.
Pump Type: Gear, centrifugal, etc.

Label(s): Red label - FLAMMABLE LIQUID; Class 3.2.
Storage Temperature: Ambient.
Hose Type: Buna-N, polyethylene, Viton and synthetic rubber.

Grades or Purity: By flashpoint, petroleum naphtha f.p. >38°C; naphtha solvent f.p. ~43°C; naphtha vm&p -7 to -13°C.
Containers and Materials: Drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): Insoluble.
Molecular Weight: Variable, mixtures of hydrocarbons.
Vapour Pressure: Variable, 0 to 67 mm Hg (38°C).
Boiling Point: 30 to 202°C (variable).

Floatability (Water): Floats.
Odour: Gasoline-like (~5 ppm, odour threshold).
Flash Point: Variable, -20 to 50°C.
Vapour Density: Variable 2.5 to 4.8.
Specific Gravity: 0.75-0.87 (20°C) (variable).

Colour: Colourless.
Explosive Limits: 0.8 to 7.0%.
Melting Point: <-30°C.

HAZARD DATA

Human Health

Symptoms: Inhalation and ingestion: nausea, vomiting, coughing, irritation of respiratory tract, weakness, dizziness, unconsciousness. Contact: eyes - slightly irritating, skin - dermatitis.
Toxicology: Moderately toxic by inhalation.
TLV® (inhalation) No information.
Short-term Inhalation Limits - No information.

LC_{50} - No information.
LC_{Lo} - Inhalation: rat = 1 600 ppm
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 0.5 to 5.0 g/kg
LD_{Lo} - Intraperitoneal: mammal = 2.5 g/kg

Fire

Fire Extinguishing Agents: Use foam, carbon dioxide or dry chemical. Water may be ineffective but may be used to cool fire-exposed containers and to protect personnel.
Behaviour in Fire: Flash back may occur along vapour trail.
Ignition Temperature: 229 to 293°C.
Burning Rate: 4 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Can react with oxidizing materials. Reacts violently with chromates.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Toxic to fish at approximately 10 ppm. BOD: Not available.
Land-Air: No information.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all sources of ignition. Call supplier or manufacturer. Call environmental authorities.

Protective Clothing and Equipment

Respiratory protection - in fires - self-contained breathing apparatus, otherwise; Coveralls. Gloves - polyethylene or suitable plastic. Boots - high (not natural rubber). Goggles - or face shield.

Fire and Explosion

Use foam, dry chemical or carbon dioxide to extinguish. Water may be ineffective, but may be used to cool fire-exposed containers and protect personnel. Flash back may occur along vapour trail.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing, and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: do not induce vomiting in conscious victim. Keep victim warm and quiet. If medical assistance is not immediately available, transport victim to doctor, hospital or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

NAPHTHALENE $C_{10}H_8$

IDENTIFICATION

UN No. 1334 refined or crude

Common Synonyms	Observable Characteristics	Manufacturers
NAPHTHALIN TAR CAMPHOR MOTH FLAKES MOTH BALLS	Colourless powder or flakes. Aromatic "mothball" odour.	Record Chemical Co. Ltd., Montreal, Que. Kent Laboratories Ltd., Vancouver, B.C.

Transportation and Storage Information

Shipping State: Solid.
Classification: Flammable solid.
Inert Atmosphere: No requirement.
Venting: Open.

Label(s): Red and white label - FLAMMABLE SOLID; Class 4.1, Group III.
Storage Temperature: Ambient.

Grades or Purity: Pure: mp = 80°C, crude: mp = 74 to 80°C.
Containers and Materials: Cans, drums; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): 0.0034 g/100 mL (25°C).
Molecular Weight: 128.2
Vapour Pressure: 1 mm Hg (53°C).
Boiling Point: 218°C (sublimes).

Floatability (Water): Sinks. Naphthalene in some forms includes sufficient air pockets to allow floatation.
Odour: Aromatic mothball odour (0.03 ppm, odour threshold).
Flash Point: 88°C (o.c.); 79°C (c.c.).
Vapour Density: 4.4
Specific Gravity: 1.15 (20°C).

Colour: Colourless.
Explosive Limits: 0.9 to 5.9%.
Melting Point: 80.2°C, volatilizes at room temperature.

HAZARD DATA

Human Health

Symptoms: Inhalation: vapours may cause coughing, headache, mental confusion, nausea and vomiting. Ingestion: nausea, vomiting, diarrhea, general fatigue and symptoms similar to inhalation. Contact: skin - irritation and dermatitis; eyes - irritation and watering.

Toxicology:
TLV® (inhalation) 10 ppm; 50 mg/m^3.
Short-term Inhalation Limits - 15 ppm; 75 mg/m^3 (15 min).

LC_{50} - Not available.
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 1.78 g/kg

Fire

Fire Extinguishing Agents: Water spray, carbon dioxide, dry chemical or foam. Water spray may cause extensive foaming.
Behaviour in Fire: No information.
Ignition Temperature: 526°C.
Burning Rate: 4.3 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: May react with oxidizing materials. Reacts violently with chromic anhydride.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 150 ppm/96 h/sunfish/TLm/freshwater; Aquatic toxicity rating = 1 to 10 ppm/96 h/TLm/freshwater; 150 to 220 mg/L/48 h/mosquito fish/TLm/freshwater; 1.8 ppm/72 h/fingerling salmon/critical/saltwater; BOD: 0%, 5 days; 192%, 25 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

COMBUSTIBLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Avoid contact and inhalation. Call manufacturer. Stop or reduce discharge if safe to do so. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - in fires or enclosed spaces, self-contained breathing apparatus; otherwise: Goggles -(mono), tight fitting. If face shield is used, it must not replace goggles. Gloves - rubber. Boots - rubber (pants worn outside boots). Coveralls or acid suit - rubber, if in fire or major spill.

Fire and Explosion

Use water spray, dry chemical, alcohol foam or carbon dioxide to extinguish. Water spray may cause extensive foaming.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin and eyes - remove contaminated clothing and flush affected areas with plenty of water. Ingestion: give water to conscious victim. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

NATURAL GAS

IDENTIFICATION

UN No. 1971 compressed
1972 refrigerated liquid

Common Synonyms	Observable Characteristics	Manufacturers
LNG GAS Typical composition 85% methane, 10% ethane, 3% propane, 2% butane, pentanes and others. Unprocessed varieties may contain up to 50% H_2S, which is very toxic.	Colourless, odourless gas if pure. Commercial varieties have methyl mercaptan added as an odour.	Universally available.

Transportation and Storage Information

Shipping State: Gas or liquid (compressed gas or refrigerated).
Classification: Flammable gas.
Inert Atmosphere: No requirement.
Venting: Safety-relief.

Label(s): Red label - FLAMMABLE GAS.
Storage Temperature: Ambient or at -162°C.

Grades or Purity: Variable.
Containers and Materials: Cylinders, tank trucks, tank cars, tank vessels; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas.
Solubility (Water): 0.006 g/mL (20°C).
Molecular Weight: Variable.
Vapour Pressure: 2 900 mm Hg (-140°C); 16 600 mm Hg (-100°C).
Boiling Point: -162 to -130°C.

Floatability (Water): Floats and boils.
Odour: Odourless unless methyl mercaptan has been added.
Flash Point: <-50°C.
Vapour Density: 0.7 to 1.40
Specific Gravity: (liquid) 0.4 to 0.5 (at -162 to -130°C).

Colour: Colourless.
Explosive Limits: 3.8 to 17%.
Melting Point: -182 to -150°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: asphyxiant, headache, laboured breathing, unconsciousness. Contact: skin - frostbite; eyes - frostbite.
Toxicology: Low toxicity by all routes.
TLV® (Inhalation) No information.
Short-term Inhalation Limits - No information.

LC_{50} - No information.
Delayed Toxicity - No information.

LD_{50} - No information.

Fire

Fire Extinguishing Agents: Stop flow of gas. Most fire extinguishing agents may be used. Water should be used to cool fire-exposed containers.
Behaviour in Fire: Containers may rupture violently in fires.
Ignition Temperature: 482 to 632°C.

Burning Rate: No information.

Reactivity

With Water: No reaction.
With Common Materials: No information.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. No information on aquatic toxicity.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards FLAMMABLE.
Immediate Responses Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Notify manufacturer or supplier. Notify environmental authorities.
Protective Clothing and Equipment In fires Respiratory protection - self-contained breathing apparatus; otherwise, protective outer clothing as required.
Fire and Explosion Stop flow of gas. Most fire extinguishing agents may be used. Water should be used to cool fire-exposed containers. Containers may rupture violently in fires.
First Aid Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing, flush affected areas with plenty of water and treat as for frostbite; eyes - irrigate with plenty of water. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response **Water-Land-Air** 1. Stop or reduce discharge if safe to do so. 2. Contact manufacturer or supplier for advice. 3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.
Disposal 1. Contact manufacturer or supplier for advice on disposal. 2. Contact environmental authorities for advice on disposal.

NITRIC ACID HNO_3

IDENTIFICATION

UN No. 2032 fuming
2031 >40% acid
1760 <40% acid

Common Synonyms	Observable Characteristics	Manufacturers
RED FUMING NITRIC ACID (RFNA) 8 to 17% NO_2 WHITE FUMING NITRIC ACID (WFNA) 0.1 to 0.4% NO_2	Clear, colourless to slightly yellow liquid (aqueous solution). Strong, pungent odour. Fumes in humid air.	Canadian Industries Ltd., Carseland, Alta., Courtwright, Ont., McMasterville, Que. Cyanamid of Canada Ltd., Niagara Falls, Ont. Esso Chemical Canada, Redwater, Alta. Nitrochem, Maitland, Ontario.

Transportation and Storage Information

Shipping State: Liquid (aqueous solution).
Classification: Corrosive, oxidizer, poison.
Inert Atmosphere: No requirement.
Venting: Open or pressure-vacuum.
Pump Type: Gear, centrifugal; stainless steel.

Label(s): <70%, Black and white label - CORROSIVE; Class 8, Group I; fuming. Yellow label - OXIDIZER; Class 5.1, Group I. White label - POISON; Class 6.1, Group I.
Storage Temperature: Ambient.
Hose Type: Flexible stainless steel, Teflon-lined, or comparable type.

Grades or Purity: 36°Bé, 52.3% HNO_3; 40°Bé, 67.38% min. HNO_3; 48.5°Bé, 95.1% min. HNO_3. Red fuming (strengths >85.7); White fuming (strengths >97.5).
Containers and Materials: Tank cars, tank trucks, drums; stainless steel, aluminum.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid (aqueous solution).
Solubility (Water): Soluble in all proportions.
Molecular Weight: 63.0 (solute).
Vapour Pressure: 7 mm Hg (20°C) (70% solution); 42 mm Hg (20°C) (100% solution).

Floatability (Water): Sinks and mixes.
Odour: Strong, pungent.
Flash Point: Not flammable.
Vapour Density: 2.2
Boiling Point: 119°C (40°Bé); 121°C (42°Bé). Higher grades decompose at 86°C.

Colour: Colourless to light yellow.
Explosive Limits: Not flammable.
Melting Point: 36°Bé, -19.5°C; 40°Bé, -24.5°C; 42°Bé, -33.0°C; 48.5°Bé, -52.0°C.
Specific Gravity: 1.33 (36°Bé); 1.38 (40°Bé); 1.41 (42°Bé); 1.50 (48.5°Bé).

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of mucous membranes, difficulty breathing, coughing fits, nausea, and muscular weakness. Ingestion: irritation and burning, intense thirst, abdominal cramps, nausea and vomiting, difficulty breathing, convulsions and coma. Contact: skin - yellow discolouration, burning sensation, inflammation, blisters; eyes - burning, watering, ulceration, loss of sight.
Toxicology: Highly toxic to skin eyes and mucous membranes.

TLV - (inhalation) 2 ppm; 5 mg/m^3.
Short-term Inhalation Limits - 4 ppm; 10 mg/m^3 (15 min).

LC_{50} - Inhalation: rat = 65 ppm/4 h red fuming (NO_2); Inhalation: rat = 242 ppm/30 min white fuming (NO_2)

LD_{50} - Oral: rat = 0.05 to 0.5 g/kg
LD_{Lo} - Oral: human = 0.43 g/kg
Delayed Toxicity - No information.

Fire

Fire Extinguishing Agents: Not combustible. Use water spray in fires involving nitric acid. Water spray may be used to knock down vapours.
Behaviour in Fire: In fires toxic NO_x fumes are evolved.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: No reaction; very soluble. Mixes exothermically and may release toxic NO_x fumes.
With Common Materials: Strong oxidizer, may react with many organics to cause fires or release toxic NO_x fumes. Reacts violently with acetic acid, acetic anhydride, (acetone & acetic acid), acetylene, acrolein, acrylonitrile, allyl alcohol, allyl chloride, ammonia, ammonium hydroxide, aniline, arsine, calcium hypophosphite, carbon, chlorosulfonic acid, cresol, cumene, cyanides, cyclic ketones, cyclohexanol, cyclohexanone, epichlorohydrin, ethyl alcohol, ferrous oxide, fluorine, furfuryal alcohol, hydrazine, hydrogen iodide, hydrogen peroxide, hydrogen sulfide, lithium, magnesium, manganese, nitrobenzene, oleum, phosphine, phosphorus, phosphorus trichloride, phthalic acid, phthalic anhydride, potassium hypophosphite, propylene oxide, pyridine, sodium, sodium hydroxide, sulfamic acid, (sulfuric acid & glycerides), titanium, vinyl acetate and zinc.
Stability: Reactive and oxidizing.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 72 ppm/96 h/mosquito fish/TLm/freshwater; Aquatic toxicity rating = 10 to 100 ppm/96 h/TLm; 750 ppm/48 h/goldfish/LC_{100}/freshwater; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE. OXIDIZER. POISON. Reactive.

Immediate Responses

Keep non-involved people away from spill site. Issue warnings: "CORROSIVE; OXIDIZER; POISON". Call Fire Department. Avoid contact and inhalation. Contact manufacturer for guidance and assistance. Evacuate from downwind if oxides of nitrogen present. Stop or reduce discharge, if this can be done without risk. Contain spill by diking to prevent runoff. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and protective clothing. Gloves - rubber. Boots - high, rubber (pants worn outside boots).

Fire and Explosion

Not combustible. Use water spray on fires involving nitric acid. Water spray may be used to knock down vapours. In fires, toxic NO_x fumes are evolved.

First Aid

Move victim from spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: eyes - immediately irrigate with plenty of water; skin - remove contaminated clothing and flush with plenty of water. Ingestion: do not induce vomiting. Keep victim warm and quiet. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Soils contaminated by nitric acid might be neutralized with lime (environmental authorities' approval required).
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal of material.
2. Contact environmental authorities for advice on disposal.

NITRILOTRIACETIC ACID $N(CH_2COOH)_3$

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
AMINOTRIACETIC ACID TRIGLYCINE NTA TRIGLYCOLLAMIC ACID N,N - bis (CARBOXYMETHYLGLYSINE)	White solid. Odourless.	Clough Chemical Co. Ltd., St. Jean, Quebec.

Transportation and Storage Information

Shipping State: Solid.	**Label(s):** Not regulated.	**Grades or Purity:** Commercial 99.5 +%.
Classification: Not regulated.	**Storage Temperature:** Ambient.	**Containers and Materials:** Cans, drums; steel.
Inert Atmosphere: No requirement.		
Venting: Open.		

Physical and Chemical Characteristics

Physical State (20°C, 1 atm)**:** Solid.	**Floatability** (Water)**:** Sinks.	**Colour:** White.
Solubility (Water)**:** 0.13 g/100mL (22.5°C)	**Odour:** Odourless.	**Explosive Limits:** Not flammable.
Molecular Weight: 191.2	**Flash Point:** Not flammable.	**Melting Point:** Decomposes 240°C.
Vapour Pressure: No information.	**Vapour Density:** No information.	
Boiling Point: Decomposes 240°C.	**Specific Gravity:** >1 at 20°C (solid).	

HAZARD DATA

Human Health

Symptoms: Contact: skin and eyes - irritation - little information available.
Toxicology: No information.

TLV® No information.	LC_{50} - No information.	LD_{50} - Oral: rat = 1.47 g/kg
Short-term Inhalation Limits - No information.	Delayed Toxicity - Suspected carcinogen.	

Fire

Fire Extinguishing Agents: Most fire extinguishing agents may be used on fires involving nitrilotriacetic acid.
Behaviour in Fire: Releases toxic fumes when heated.
Ignition Temperature: No information. **Burning Rate:** No information.

Reactivity

With Water: No reaction.
With Common Materials: No information.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 340 ppm/24 h/guppy/lethal concentration/freshwater; BOD: 0%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from spill site. Call Fire Department. Avoid contact and inhalation. Call manufacturer. Call environmental authorities.

Protective Clothing and Equipment:

In fires or confined spaces Respiratory protection - self-contained breathing apparatus; otherwise, protective clothing as required.

Fire and Explosion

Most fire extinguishing agents may be used on fires involving nitrilotriacetic acid. Releases toxic fumes when heated.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give conscious victim water to drink. If medical assistance is not immediately available, transport victim to doctor, hospital or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Remove materials by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

NITROGLYCERINE $CH_2NO_3CHNO_3CH_2NO_3$

IDENTIFICATION

UN No. 0143 (desensitized)
1204 (<1% nitroglycerin in alcohol)

Common Synonyms	Observable Characteristics	Manufacturers
NG 1,2,3-PROPANETRIOL TRINITRATE GLYCERYL TRINITRATE BLASTING OIL GLYCEROL, NITRIC ACID TRIESTER NITROGLYCEROL, BLASTING GELATIN TRINITROGLYCEROL, NITROL	Colourless to yellow liquid.	Canadian Industries Ltd., (C-I-L) Montreal, Quebec. DuPont of Canada Ltd., Montreal, Quebec.

Transportation and Storage Information

Shipping State: Liquid; Solid (liquid absorbed on inert materials).
Classification: Explosive, Poison.
Inert Atmosphere: No requirement.
Venting: Open.

Label(s): Orange and black label - EXPLOSIVE; Class 1.1, Group D. White label - POISON; Class 6.1 (for desensitized). Red and white label - FLAMMABLE LIQUID; Class 3.2, Group II (for <1% nitroglycerin in alcohol).

Grades or Purity: Inerted < 5% nitroglycerin; <1% solution nitroglycerin in alcohol.
Containers and Materials: Special containers.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 0.18 g/100 mL (20°C).
Molecular Weight: 227.1
Vapour Pressure: 0.00025 mm Hg (20°C); 0.0073 mm Hg (50°C); 0.098 mm Hg (80°C).
Boiling Point: 260°C (explodes).

Floatability (Water): Sinks.
Odour: No information.
Flash Point: Explosive.
Vapour Density: 7.8
Specific Gravity: 1.60 (20°C).

Colour: Colourless to yellow.
Explosive Limits: Explosive.
Melting Point: 3 to 13°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: headache, flushing of skin, vomiting, dizziness, collapse, cyanosis, convulsions, coma and respiratory paralysis. Ingestion: symptoms similar to inhalation. Contact: skin - readily absorbed yielding symptoms similar to inhalation; eyes - burning and irritation.
Toxicology: Highly toxic by all routes.
TLV® (skin) 0.05 ppm; 0.5 mg/m^3.
Short-term Inhalation Limits - 0.1 ppm; 1 mg/m^3 (15 min).

LC_{50} - No information.
Delayed Toxicity - No information.

LD_{50} - No information.
LD_{Lo} - Subcutaneous: rabbit = 0.4 g/kg

Fire

Fire Extinguishing Agents: Material typically would explode in any situation involving fire.
Behaviour in Fire: Explodes.
Ignition Temperature: 260°C explodes.
Burning Rate: Detonation velocity 7 600 m/s

Reactivity

With Water: No reaction.
With Common Materials: No information
Stability: Unstable, when shocked or exposed to heat or flame, may explode.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 26 mg/L/tns/Daphnia magna/LD_{Lo}/freshwater; BOD: No information.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards
EXPLOSIVE. POISON. FLAMMABLE. Can be detonated by shock, heat or fire.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "EXPLOSIVE; POISON; FLAMMABLE". Evacuate area. Notify manufacturer and supplier. Notify environmental authorities.

Protective Clothing and Equipment:

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit.

Fire and Explosion

Material typically would explode in any situation involving fire.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give conscious victim water to drink and induce vomiting. If medical assistance is not immediately available, transport victim to doctor, hospital or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water-Land-Air
1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

NONYL PHENOL

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
NONYLPHENOL 2,6-DIMETHYL-4-HEPTYLPHENOL o-NONYL PHENOL p-NONYL PHENOL	Pale yellow liquid. Medicinal odour.	Domtar (CDC Division), Longford Mills, Ontario. Hart Chemical, Guelph, Ontario.

Transportation and Storage Information

Shipping State: Liquid.
Classification: None.
Inert Atmosphere: No requirement.
Venting: Open.
Pump Type: No information.

Label(s): Not regulated.
Storage Temperature: Ambient.
Hose Type: No information.

Grades or Purity: 90% para-isomer plus 4% ortho-isomer and 5% 2,4-dinonylphenol.
Containers and Materials: Drums, tank cars; steel, stainless steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): Insoluble.
Molecular Weight: 220.3
Vapour Pressure: No information.
Boiling Point: 290 to 304°C.

Floatability (Water): Floats.
Odour: Medicinal.
Flash Point: 141°C (c.c.).
Vapour Density: 7.6
Specific Gravity: 0.95 (20°C).

Colour: Pale yellow.
Explosive Limits: No information.
Melting Point: -10 to 2°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: sore throat, coughing, laboured breathing, unconsciousness, Contact: skin - severely irritating, redness, pain, burns; eyes - redness, pain; Ingestion: sore throat, abdominal pain, nausea, diarrhea.
Toxicology: Moderately toxic by ingestion and contact.
TLV - No information.
Short-term Inhalation Limits - No information.
LC_{50} - No information.
Delayed Toxicity - No information.
LD_{50} - Oral: rat = 1.62 g/kg

Fire

Fire Extinguishing Agents: Use alcohol foam, carbon dioxide or dry chemical. Water or foam may cause frothing.
Behaviour in Fire: No information.
Ignition Temperature: No information.
Burning Rate: No information.

Reactivity

With Water: No reaction.
With Common Materials: Can react with oxidizing materials.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating = 10 to 100 ppm/96h/TLm/freshwater.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

COMBUSTIBLE. CORROSIVE.

Immediate Responses

Keep non-involved people away from spill site. Call Fire Department. Avoid contact and inhalation. Notify manufacturer. Dike to contain material. Notify environmetal authorities.

Protective Clothing and Equipment

In fires or confined spaces - Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Otherwise, protective clothing as required.

Fire and Explosion

Use alcohol foam, carbon dioxide or dry chemical to extinguish. Water or foam may cause frothing.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give water to conscious victim to drink. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

OILS, CRUDE

IDENTIFICATION

UN No. 1267

Common Synonyms	Observable Characteristics	Manufacturers
PETROLEUM CRUDE	Dark brown to black oily liquids. Acrid, tarry, offensive odour.	Universally available.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Not regulated.
Inert Atmosphere: No requirement.
Venting: Open (flame arrester).
Pump Type: Centrifugal, gear, etc.

Label(s): None.
Storage Temperature: Ambient.
Hose Type: Neoprene, butyl, Viton.

Grades or Purity: Wide variety, depending on oil field where produced.
Containers and Materials: Tankers, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 0.001 mg/100 mL.
Molecular Weight: Various (mixture of hydrocarbons).
Vapour Pressure: >3 mm Hg (20°C) (typically).
Boiling Point: 150 to 300°C.

Floatability (Water): Floats.
Odour: Acrid, tarry, offensive (if high in H_2S).
Flash Point: (-10 to 20°C).
Vapour Density: Variable (typically 3 to 5).
Specific Gravity: 0.8-0.9 (15°C).

Colour: Dark brown to black.
Explosive Limits: Variable 1 to 7%.
Melting Point: Various (-60 to -20°C).

HAZARD DATA

Human Health

Symptoms: Inhalation: dizziness, headache. Ingestion: nausea and vomiting. Contact: skin - irritation; eyes - irritation.
Toxicology: Generally low toxicity if little H_2S is present.
TLV® (as a mineral oil mist) 5 mg/m^3
Short-term Inhalation Limits - 10 mg/m^3 (15 min) (as mineral oil mist).

LD_{50} - No information.
Delayed Toxicity - No information.

LD_{50} - No information.

Fire

Fire Extinguishing Agents: Use dry chemical, foam or carbon dioxide. Water may be ineffective, but should be used to cool fire-exposed containers.
Behaviour in Fire: Can give off toxic fumes.
Ignition Temperature: Variable; typically >400°C.
Burning Rate: 4 mm/min.

Reactivity

With Water: No reaction; insoluble.
With Common Materials: May react with oxidizing materials.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicities: 1 to 30 mg/L/96 h/rainbow trout/LC_{50}/freshwater; 330 mg/L/48 h/brown shrimp/LC_{50}/saltwater.
Land-Air: Fouling to landscape.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

COMBUSTIBLE.

Immediate Responses

Keep non-involved people away from spill site. Call Fire Department. Stop or reduce discharge, if this can be done without risk. Contain spill, if possible, to prevent or reduce runoff and pollution. Notify supplier and appropriate environmental authorities.

Protective Clothing and Equipment

Goggles or face shield. Coveralls. Gloves - rubber. Boots - rubber.

Fire and Explosion

Use dry chemical, foam or carbon dioxide to extinguish. Water may be ineffective, but should be used to cool containers exposed to fire or heat.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Contact: skin - remove oil-soaked clothing. Wipe off as much oil as possible. Wash skin thoroughly with warm water (and soap, if available) for at least 15 minutes; eyes - irrigate with water; Ingestion: give water to conscious victim to drink. Transport victim to hospital, doctor or clinic if necessary.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Collect by skimming, pumping off or sorbing on sorbent.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Prevent product from entering sewers.
5. Collect, pump off or use sorbents for residuals.
6. Collect recovered product in available containers.
7. Notify environmental authorities to discuss cleanup and disposal of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).
4. Oil and slightly contaminated oil may be recycled in a refinery.

OILS, FUEL (aviation)

IDENTIFICATION

UN No. 1863

Common Synonyms	Observable Characteristics	Manufacturers
AVIATION GASOLINE 80, 100, 115, 130 (similar to gasoline, see gasoline). JP-4, JP-5, JP-6. Type A, Type A-1, Type B, Type C (turbofuel A-1, A, B, C), (Jet A-1, A, B, C)	Yellow - brown liquids. Gasoline-like odours.	Universally available.

Transportation and Storage Information

Shipping State: Liquid. **Classification:** Flammable liquid. **Inert Atmosphere:** No requirement. **Venting:** Open (flame arrester). **Pump Type:** Gear, centrifugal; steel, stainless steel.	**Label(s):** Red and black label - FLAMMABLE LIQUID. **Storage Temperature:** Ambient. **Hose Type:** Neoprene, Viton, polyethylene.	**Grades or Purity:** Type A-1, type A, type B, type C; JP-4, JP-5, JP-6. **Containers and Materials:** Drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility (Water):** 0.003 mg/L (20°C). **Molecular Weight:** Variable (mixture of hydrocarbons). **Vapour Pressure:** typically <93 mm Hg (20°C). **Boiling Point:** (A, A-1) 163 to 259°C. (B) 72 to 235°C; (4, 5, 6) 121 to 260°C.	**Floatability (Water):** Float. **Odour:** Gasoline-like. **Flash Point:** (A-1, A) 43 to 66°C; (B, 4) -23 to -1°; (5) 35 to 63°C; (6) 38°C (o.c.). **Vapour Density:** typically 3 to 5 **Specific Gravity:** (A-1) 0.806; (A) 0.816; (B) 0.764	**Colour:** Yellow-brown **Explosive Limits:** Variable, JP-4, (1.3 to 8.0%; JP-6 (0.6 to 3.7%). **Melting Point:** -60 to -40°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: dizziness, headache. Ingestion: nausea and vomiting. Contact: skin - irritation; eyes - irritation.
Toxicology: Low toxicity.

TLV® 300 ppm; 900 mg/m^3 (gasoline). Short-term Inhalation Limits - 500 ppm; 1 500 mg/m^3 (gasoline).	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - No information.

Fire

Fire Extinguishing Agents: Foam, carbon dioxide or dry chemical. Water may be ineffective, but should be used to cool fire-exposed containers.
Behaviour in Fire: Flash back may occur along vapour trail.

Ignition Temperature: JP-4; 240°C; JP-5; 246°C; JP-6; 230°C.	**Burning Rate:** 4 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: May react with oxidizing agents.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 2 ppm/96 h/bluegill/LC_{50}/freshwater; 100 ppm/96 h/grass shrimp/LC_{50}/saltwater.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards
FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". Call fire department. Eliminate all sources of ignition. Notify supplier. Stop or reduce discharge if safe to do so. Dike to prevent runoff. Notify environmental authorities.

Protective Clothing and Equipment:

Gloves and Boots: neoprene, butyl rubber. Appropriate goggles or face shield.

Fire and Explosion

Use foam, carbon dioxide or dry chemical to extinguish. Water may be ineffective, but should be used to cool fire-exposed containers. Flashback may occur along vapour trail.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with soap and water; eyes - irrigate with water. Ingestion: give conscious victim water to drink; do not induce vomiting. If medical assistance is not immediately available, transport victim to doctor, hospital or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water
1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain spill by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air
1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Adsorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss cleanup and disposal of contaminated materials.

Disposal

1. Contact supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).
4. Oil and slightly contaminated oil may be recycled in a refinery.

OILS, FUEL (distillates 1, 2 and 2D)

IDENTIFICATION

UN No. 1233 kerosene (fuel oil no. 1)

Common Synonyms	Observable Characteristics	Manufacturers
KEROSENE (FUEL OIL NO. 1) FUEL OIL NO. 1, 2, 2-D DIESEL OIL LIGHT HOME HEATING OIL Fuel Oil No. 2 and 2-D DIESEL OIL MEDIUM	Oily liquids. Light brown to brown colour. Characteristic diesel fuel-like odour.	Universally available.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable liquid (kerosene).
Inert Atmosphere: No requirement.
Venting: Open (flame arrester).
Pump Type: Gear or centrifugal. Steel or stainless steel.

Label(s): Red label - FLAMMABLE LIQUID (kerosene).
Storage Temperature: Ambient.
Hose Type: Neoprene, Viton, polyethylene.

Grades or Purity: Kerosene, diesel fuel 1-D, diesel fuel 2; diesel fuel 2-D.
Containers and Materials: Drums, tank cars, tank trucks, tankers; steel.

Physical and Chemical Characteristics

Physical state (20°C, 1 atm): Liquid.
Solubility (Water): Insoluble (about 30 ppm).
Molecular Weight: Variable.
Vapour Pressure: <1 mm Hg (20°C).
Boiling Point: 150 to 350°C.

Floatability (Water): Float.
Odour: Characteristic diesel-like (about 0.1 ppm, odour threshold).
Flash Point: (Fuel 1) 43 to 72°C; (Fuel 2) 52 to 96°C.
Vapour Density: about 3 to 5
Specific Gravity: 0.81 to 0.90 (20°C).

Colour: Light brown to brown.
Explosive Limits: 0.7 to 5% (fuel 1).
Melting Point: -18 to -46°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: dizziness, headache. Ingestion: nausea and vomiting. Contact: skin - irritation; eyes - irritation. pneumonitis. Dermatitis may result from prolonged and repeated skin exposure.
Toxicology: Low toxicity by all routes.
TLV® (inhalation) 5 mg/m^3 (mineral oil particulate mist).
Short-term Inhalation Limits - 10 mg/m^3 for 15 min (oil particulate mineral mist).

LC_{50} - No information.
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 28 g/kg
LD_{50} - Oral: rabbit = 0.2 g/kg

Fire

Fire Extinguishing Agents: Foam, carbon dioxide or dry chemical. Water may be ineffective but should be used to cool fire-exposed containers.
Behaviour in Fire: Flash back may occur along vapour trail.
Ignition Temperature: (Fuel 1) 210°C; (Fuel 2) 257°C.
Burning Rate: 4 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Reacts with oxidizing agents.
Stability: Stable.

Environment

Water: Prevent entry into water intakes or waterways. Fish toxicity: 10 ppm/96 h/rainbow trout/lethal/LC_{50}/freshwater; 95 to 135 ppm/96 h/bluegill/LC_{50}/freshwater (fuel oil no. 2); 2 ppm/96 h/grass shrimp/LC_{50}/saltwater; BOD: Not available.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all sources of ignition. Notify supplier. Stop or reduce discharge if this can be done without risk. Dike to contain spill and prevent runoff. Notify environmental authorities.

Protective Clothing and Equipment

Gloves and Boots - neoprene, butyl rubber. Appropriate goggles or face shield.

Fire and Explosion

Use foam, carbon dioxide or dry chemical to extinguish. Water may be ineffective, but should be used to cool fire-exposed containers. Flash back may occur along vapour trail.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if necessary. Contact: skin - remove contaminated clothing follow by washing affected areas with soap and water; eyes - irrigate eyes with plenty of water. Ingestion: do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).
4. Oil and slightly contaminated oil may be recycled in a refinery.

OILS, FUEL (Residual Oils or Fuels 4, 5 and 6 Bunker)

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
RESIDUAL FUEL OIL NO. 4 (Bunker A) RESIDUAL FUEL OIL NO. 5 (Bunker B) RESIDUAL FUEL OIL NO. 6 (Bunker C) BUNKER FUEL OIL	Heavy, oily, high-viscosity liquids. Brown to black. Characteristic diesel fuel-like odour.	Universally available.

Transportation and Storage Information

Shipping State: Liquid. **Classification:** None. **Inert Atmosphere:** No requirement. **Venting:** Open (flame arrester). **Pump Type:** Gear or centrifugal.	**Label(s):** Not regulated. **Storage Temperature:** Ambient or may be heated. **Hose Type:** Neoprene, Viton, polyethylene.	**Grades or Purity:** Fuel oil (residual) No. 4, fuel oil (residual) No. 5, fuel oil (residual) No. 6 **Containers and Materials:** Drums, tank trucks tank cars, tankers; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility (Water):** Insoluble, <10 ppm. **Molecular Weight:** Variable. **Vapour Pressure:** No information; <1 mm Hg, 20°C approximately). **Boiling Point:** 185 to 500°C.	**Floatability (Water):** Floats. **Odour:** Characteristic diesel fuel-like (about 0.1 ppm, odour threshold). **Flash Point:** (No. 4) 61 to 116°C; (No. 5 light) 69 to 169°C, (No. 5 heavy) 70 to 121°C; (No. 6) 66 to 132°C. **Vapour Density:** Variable; 3 to 5 **Specific Gravity:** 0.90 to 1.05 (15.5°C).	**Colour:** Brown to black. **Explosive Limits:** 1 to 5% (approximate). **Melting Point:** -29 to 10°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: dizziness, headache. Ingestion: nausea and vomiting. Contact: skin - irritation; eyes - irritation.
Toxicology: Low toxicity by all routes.

TLV® (inhalation) 5 mg/m^3 (mineral oil mist). Short-term Inhalation Limits - 10 mg/m^3 for 15 min (mineral oil particulate mist).	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - No information.

Fire

Fire Extinguishing Agents: Dry chemical, foam or carbon dioxide. Water may be ineffective but may be used to cool fire-exposed containers.
Behaviour in Fire: In fires, toxic fumes may be emitted.
Ignition Temperature: No.4 263°C; No.6 407°C. **Burning Rate:** 4 mm/min (approx.).

Reactivity

With Water: No reaction.
With Common Materials: May react with strong oxidizing agents.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 40 to 100 ppm/96 h/rainbow trout/LC_{50}/freshwater. Fuel oil no. 6, 26 ppm/96 h/grass shrimp/CL_{50}/saltwater; 21 ppm/96 h/mosquito fish/LC_{50}/freshwater; BOD: Not available.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE. COMBUSTIBLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all sources of ignition. Notify supplier. Stop or reduce discharge if this can be done without risk. Dike spill area to contain runoff. Notify environmental authorities.

Protective Clothing and Equipment

Gloves and Boots - neoprene, butyl rubber. Appropriate goggles or face shield.

Fire and Explosion

Use foam, carbon dioxide or dry chemical to extinguish. Water may be ineffective, but should be used to cool fire-exposed containers. In fires, toxic fumes may be emitted.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: remove from exposure and give artificial respiration if necessary. Contact: skin - remove contaminated clothing and wash affected areas with soap and water; eyes - irrigate with plenty of water. Ingestion: give water to conscious victim to drink. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (environmental authorities' approval required).
4. Oil and slightly contaminated oil may be recycled in a refinery.

OLEUM $H_2SO_4 + SO_3$

IDENTIFICATION

UN No. 1831

Common Synonyms	Observable Characteristics	Manufacturers
FUMING SULPHURIC ACID SULPHURIC ACID, FUMING DISULPHURIC ACID (see sulfuric acid for dilute solutions).	Colourless to brown; heavy, oily liquid. Sharp, choking odour. Fumes on contact with moist air.	Canadian Industries Ltd., Montreal, Quebec. Du Pont Canada Ltd., Montreal, Quebec. Cominco Ltd., Vancouver, B.C. Imperial Oil Ltd., Toronto, Ontario. International Minerals and Chemicals Corp. Ltd., Toronto, Ontario.

Transportation and Storage Information

Shipping State: Liquid. **Classification:** Corrosive, poisonous liquid. **Inert Atmosphere:** No requirement. **Venting:** Open. **Pump Type:** Centrifugal. Alloy 20, Durimet, Worthite.	**Label(s):** Black and white label - CORROSIVE; Class 8, Group I. White label - POISON; Class 6.1, Group I. **Storage Temperature:** Ambient. **Hose Type:** Up to 30%-polypropylene, Teflon-lined. Above 30%, flexible stainless steel or rigid piping with swivel joints.	**Grades or Purity:** 20 to 65% free SO_3 (104.5 to 114.6% equivalent H_2SO_4); technical, commercial. **Containers and Materials:** Bottles, drums, tank cars, tank trucks; steel, stainless steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility (Water):** Soluble in water with vigorous reaction. **Molecular Weight:** Variable. **Vapour Pressure:** No information. **Boiling Point:** Decomposes.	**Floatability (Water):** Reacts vigorously, releasing heat. **Odour:** Sharp, choking (1 mg/m^3 odour threshold). **Flash Point:** Not flammable. **Vapour Density:** Approx. 2.8 (20°C). **Specific Gravity:** 20% 1.88; 30% 1.92; 40% 1.95; 65% 1.98 (38°C).	**Colour:** Colourless to dark brown, depending on purity. **Explosive Limits:** Not flammable. **Melting Point:** -9°C, 20% free SO_3; 15.5°C, 30% free SO_3; 33.0°C, 40% free SO_3; and 3.6°C, 65% free SO_3.

HAZARD DATA

Human Health

Symptoms: Inhalation: sore throat, coughing, laboured breathing. Contact: eyes or skin - produces severe burns. Ingestion: sore throat, abdominal pain, nausea and vomiting.
Toxicology: Highly toxic by all routes.

TLV®- (inhalation) 1 mg/m^3 (as sulfuric acid). Short-term Inhalation Limits - No information.	LC_{50} - Inhalation: rat = 347 ppm/1 h Delayed Toxicity - None known.	LD_{50} - No information.

Fire

Fire Extinguishing Agents: Not combustible. Use dry chemical on adjacent fires. Avoid use of water.
Behaviour in Fire: Not combustible. Toxic SO_x fumes are released in fires.
Ignition Temperature: Not combustible. **Burning Rate:** Not combustible.

Reactivity

With Water: Reacts vigorously and exothermically producing toxic SO_x fumes.
With Common Materials: May cause ignition by contact with combustible materials. Can react violently with reducing agents, acetic acid, acetic anhydride, acetonitrile, acrolein, acrylic acid, acrylonitrile, allyl alcohol, allyl chloride, ammonium hydroxide, aniline, n-butyraldehyde, cresol, cumene, diethylene glycol, epichlorohydrin, ethyl acetate, ethylene glycol, hydrochloric acid, hydrofluoric acid, isoprene, propylene oxide, pyridine, sodium hydroxide, stryene, vinyl acetate.
Stability: Stable (within the limits of the foregoing).

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life in very low concentrations. Aquatic toxicity = 10 to 100 ppm/96 h/TLm/freshwater; 43 ppm/48 h/prawn/LC_{50}/saltwater; 24 mg/L/24 h/bluegill/lethal/freshwater; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE. POISON. Reacts with water. Reacts with many materials.

Immediate Responses

Keep non-involved people away from spill site. Issue warnings: "CORROSIVE; POISON". Call Fire Department. Evacuate from downwind. Avoid contact and inhalation. Contact manufacturer. Contain spill area by diking. Stop discharge if possible. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit (acid suit, rubber). Gloves - gauntlet type, rubber. Boots - high, rubber (pants worn outside boots).

Fire and Explosion

Not combustible. Use dry chemical on adjacent fires. Avoid use of water. Toxic SO_x fumes are released in fires.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: eyes - irrigate immediately with plenty of water. If pain persists, continue irrigation; skin - remove contaminated clothing and flush affected areas with plenty of water. Ingestion: give conscious victim plenty of water to drink. Do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Remove material by manual or mechanical means.
6. Remove contaminated soil for disposal or neutralize with lime.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

OXYGEN O_2

IDENTIFICATION

UN No. 1072 (compressed gas)

Common Synonyms	Observable Characteristics	Manufacturers
LOX LIQUID OXYGEN	Colourless gas or liquid. Odourless.	Canadian Liquid Air Ltd., Hamilton, Ontario. Union Carbide Canada Ltd., Sault Ste.-Marie, Ontario. Inco, Copper Cliff, Ontario. Dofasco, Hamilton, Ontario.

Transportation and Storage Information

Shipping State: Gas (compressed); liquid (compressed or liquefied gas).
Classification: Nonflammable compressed gas; oxidizer.
Inert Atmosphere: No requirement.
Venting: Safety relief.

Label(s): Green label - NON-FLAMMABLE GAS; Class 2.2. Yellow Label - OXIDIZER; Class 5.1.
Storage Temperature: Ambient.
Hose Type: Braided, high pressure, degreased for oxygen service.

Grades or Purity: 99.5 + %.
Containers and Materials: Cylinders, tank cars; steel (gas) cylinders, tank truck; steel (liquid).

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas.
Solubility (Water): 0.004 g/100mL (25°C).
Molecular Weight: 32.0
Vapour Pressure: 1 200 mm Hg (-178°C); 31 600 mm Hg (-123°C).
Boiling Point: -183°C.

Floatability (Water): Floats and boils (liquid).
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: 1.1 (25°C).
Specific Gravity: Liquid, 1.14 (-183°C).

Colour: Colourless.
Explosive Limits: Not flammable.
Melting Point: -218.8°C.

HAZARD DATA

Human Health

Symptoms: Contact: with liquid may produce frostbite or burns to skin and eyes. Inhalation: generally no toxic effect, overdoses may cause irritation of mucous membranes due to dryness.
Toxicology: Relatively nontoxic.
TLV®- No information.
Short-term Inhalation Limits - No information.

LC_{50} - No information.
TC_{Lo} - Inhalation: human = 100%/14 h
Delayed Toxicity - No information.

LD_{50} - Not pertinent.

Fire

Fire Extinguishing Agents: Stop flow of gas before attempting to extinguish fire. Most fire extinguishing agents may be used on fires involving oxygen. Water may be used to cool fire-exposed containers.
Behaviour in Fire: Not flammable or combustible but vigorously supports combustion of a wide range of materials.
Ignition Temperature: Not flammable or combustible.
Burning Rate: Not flammable or combustible.

Reactivity

With Water: No reaction.
With Common Materials: May react explosively with combustible materials. Reacts violently with aluminum compounds, ethers, hydrogen, trichloroethane, trichloroethylene, benzene, carbon monoxide, chlorinated hydrocarbons and many fuels; carbon tetrachloride, hydrazine, lithium hydride, magnesium, methane, methylene chloride, oil, paraformaldehyde and titanium.
Stability: Stable.

Environment

Water: Little hazard.
Land-Air: Little hazard.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

OXIDIZER.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "OXIDIZER". Call Fire Department. Eliminate all sources of ignition. Call manufacturer or supplier. Avoid contact with liquid. Stop or reduce discharge if safe to do so. Notify environmental authorities.

Protective Clothing and Equipment

Coveralls, gloves (asbestos or non-flammable) and goggles (mono, tight fitting). All exposed clothing must be ventilated thoroughly after exposure (30 min) to eliminate oxygen.

Fire and Explosion

Stop flow of gas before attempting to extinguish fire. Most fire extinguishing agents may be used on fires involving oxygen. Water may be used to cool fire-exposed containers.

First Aid

Move victim out of spill area. Call for medical assistance, but start first aid at once. Inhalation: move victim to fresh air; apply artificial respiration if necessary. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; treat as for frostbite (liquid); eyes - irrigate with plenty of water. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water-Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Allow to disperse.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Material can be safely dispersed into the environment.

PENTACHLOROPHENOL C_6Cl_5OH

IDENTIFICATION

UN No. NA 2020

Common Trade Names and Synonyms	Observable Characteristics	Manufacturers
DOWICIDE 7 SANTOPHEN 20 PCP PENCHLOROL PENTA PERMATOX (Also see sodium pentachlorophenate).	White to light-brown crystalline solid or powder. Weak odour. Strong pungent odour when heated.	Uniroyal Chemicals Ltd., Edmonton, Alberta.

Transportation and Storage Information

Shipping State: Solid. **Classification:** Poison. **Inert Atmosphere:** No requirement. **Venting:** Open.	**Label(s):** White label - POISON. **Storage Temperature:** Ambient.	**Grades or Purity:** 86 to 100%. **Containers and Materials:** Bags, fibre drums, bulk by rail or truck.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid. **Solubility (Water):** Slightly soluble. 0.0005 g/100 mL (0°C); 0.0014 g/100 mL (20°C); 0.0035 g/100 mL (50°C). **Molecular Weight:** 266.4 **Vapour Pressure:** 0.00011 mm Hg (20°C); 40 mm Hg (211.2°C). **Boiling Point:** Decomposes at 310°C.	**Floatability (Water):** Sinks. **Odour:** Weak. Strong pungent odour when heated. **Flash Point:** Not flammable. **Vapour Density:** 9.2 **Specific Gravity:** 1.98 (22°C).	**Colour:** White to light brown. **Explosive Limits:** Not flammable. **Melting Point:** 188 to 191°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: coughing, nausea, vomiting, abdominal cramps, sweating, fever, rapid pulse, convulsions, loss of consciousness. Contact: skin - may be absorbed, irritation, inflammation; eyes - irritation and watering.
Toxicology: Highly toxic by all routes.

TLV®- (skin) 0.5 mg/m^3. Short-term Inhalation/Skin Limits - 1.5 mg/m^3 (15 min).	LC_{50} - No information. Delayed Toxicity - May cause liver and kidney damage.	LD_{50} - Oral: rat = 0.050 g/kg

Fire

Fire Extinguishing Agents: Use water spray, dry chemical, foam or carbon dioxide. Use water to cool fire-exposed containers.
Behaviour in Fire: When heated to decomposition, toxic fumes of chlorides are evolved.

Ignition Temperature: Not combustible.	**Burning Rate:** Not combustible.

Reactivity

With Water: No reaction.
With Common Materials: No information.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 5 ppm/3 h/trout/lethal/freshwater; 0.24 mg/L/24 h/fathead minnow/LC_{50}/freshwater; 0.267 mg/L/24 h/goldfish/LC_{50}/freshwater; EPA criteria: 6.2 mg/L/24 h (conc. should not exceed 14 µg/L fresh H_2O at any time); BOD: Not available.
Land-Air: Toxic to plant life; 4 500 ppm/LC_{50}/mallard.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "POISON". Avoid contact and inhalation. Dike to prevent runoff from rainwater or water application. Notify supplier. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - in fires or enclosed spaces use self-contained breathing apparatus and totally encapsulated suit. Gloves - gauntlet type, rubber, unlined. Boots - rubber, high (pants worn outside boots).

Fire and Explosion

Use water spray, dry chemical, foam or carbon dioxide to extinguish. Use water to cool fire-exposed containers. When heated to decomposition, toxic fumes of chlorides are evolved.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin and eyes - remove contaminated clothing and wash eyes and affected skin with plenty of water. Ingestion: give water to conscious victim to drink and induce vomiting. Keep victim warm and quiet. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove liquids, contaminants and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

PENTAERYTHRITOL $C(CH_2OH)_4$

IDENTIFICATION

Common Trade Names and Synonyms	Observable Characteristics	Manufacturers
2,2-bis (HYDROXYMETHYL)-1,3 - PROPANEDIOL TETRAMETHYLOLMETHANE PENTAERYTHRITE TETRAHYDROXYMETHYLMETHANE PE mono PE, PENTEK TETRAKIS (HYDROXYMETHYL) METHANE	White solid. Odourless.	Celanese Canada, Edmonton, Alberta.

Transportation and Storage Information

Shipping State: Solid.	**Label(s):** Not regulated.	**Grades or Purity:** Technical: 86 to 90%; involving 10 to 40% di-pentaerythritol. Pure: 98+ %.
Classification: None.	**Storage Temperature:** Ambient.	**Containers and Materials:** Bags (multiwall paper); drums, carlots; steel.
Inert Atmosphere: No requirement.		
Venting: Open.		

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.	**Floatability** (Water): Sinks and slowly mixes.	**Colour:** White.
Solubility (Water): 5.56 g/100 mL (15°C).	**Odour:** Odourless.	**Explosive Limits:** Not flammable.
Molecular Weight: 136.2	**Flash Point:** Not flammable.	**Melting Point:** Pure, 260 to 269°C; test grade, 220-230°C (sublimes from 130°C at reduced pressure).
Vapour Pressure: No information.	**Vapour Density:** 4.7	
Boiling Point: Sublimes (276°C).	**Specific Gravity:** 1.40 (25°C).	

HAZARD DATA

Human Health

Symptoms: No information.
Toxicology: Low order of toxicity.

TLV®- (nuisance particulate) 10 mg/m^3.	LC_{50} - No information.	LD_{50} - Oral: mouse = 25.5 g/kg
Short-term inhalation - (nuisance particulate) 20 mg/m^3.	**Delayed Toxicity** - No information.	LD_{50} - Oral: guinea pig = 11.3 g/kg

Fire

Fire Extinguishing Agents: Most fire extinguishing agents may be used on fires involving pentaerythritol.
Behaviour in Fire: No information.

Ignition Temperature: 45°C (dust cloud).	**Burning Rate:** No information.

Reactivity

With Water: No reaction; slightly soluble.
With Common Materials: May react with oxidizing materials. Reacts violently with acetic anhydride and nitric acid.
Stability: Stable.

Environment

Water: prevent entry into water intakes and waterways. No information on fish toxicity available. BOD: 95 to 96%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

COMBUSTIBLE.

Immediate Responses

Keep non-involved people away from spill site. Call Fire Department. Notify supplier or manufacturer. Dike to prevent runoff. Notify environmental authorities.

Protective Clothing and Equipment

Protective outerwear as required.

Fire and Explosion

Most fire extinguishing agents may be used on fires involving pentaerythritol.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: move to fresh air. Contact: skin- remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water Ingestion: give conscious victim water to drink and induce vomiting. Transport victim to hospital, doctor or clinic if necessary.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

PERCHLOROETHYLENE $Cl_2C:CCl_2$

IDENTIFICATION

UN No. 1897

Common Trade Names and Synonyms	Observable Characteristics	Manufacturers
TETRACHLOROETHYLENE CARBON BICHLORIDE ETHYLENE TETRACHLORIDE "per" DRY CLEANING FLUID	Colourless liquid. Sweet, ethereal odour.	Dow Chemical Canada Inc., Sarnia, Ontario. Canadian Industries Ltd. (C-I-L), Shawinigan, Quebec.

Transportation and Storage Information

Shipping State: Liquid. **Classification:** Poison. **Inert Atmosphere:** No requirement. **Venting:** Pressure-vacuum. **Pump Type:** Centrifugal or positive displacement; steel or stainless steel.	**Label(s):** Black and white label - POISON; Class 6.1, Group III. **Storage Temperature:** Ambient. **Hose Type:** Seamless stainless steel, Teflon, bronze. Viton and cross-linked polyethylene may be used with caution.	**Grades or Purity:** Dry cleaning and industrial, 95+%. **Containers and Materials:** Cans, drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility (Water):** 0.015 g/100 mL (25°C). **Molecular Weight:** 165.8 **Vapour Pressure:** 14 mm Hg (20°C); 24 mm Hg (30°C), 45 mm Hg (40°C). **Boiling Point:** 121°C.	**Floatability (Water):** Sinks. **Odour:** Sweet etheral (5 to 50 ppm, odour threshold). **Flash Point:** Not flammable. **Vapour Density:** 5.8 **Specific Gravity:** 1.63 (20°C).	**Colour:** Colourless. **Explosive Limits:** Not flammable. **Melting Point:** -22.4°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of nose, eyes and throat, headache, intoxication, narcosis, loss of consciousness and coma; Ingestion: gastrointestinal irritation, nausea, vomiting, diarrhea, drowsiness, narcosis. Contact: skin - absorbed, dry skin, inflammation, blisters; eyes - irritation, watering, inflammation.

Toxicology: Moderately toxic by all routes.

TLV®- (skin) 50 ppm; 335 mg/m^3. Short-term Inhalation Limits - 200 ppm; 1 340 mg/m^3.	LC_{50} - 5 040 ppm (8 h) rat. TC_{Lo} - Inhalation: human = 10 000 mg/m^3. Delayed Toxicity - May cause liver and kidney damage.	LD_{50} - Oral: rat = 2.60 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used. Water may be used to cool fire-exposed containers.
Behaviour in Fire: When heated to decomposition, emits toxic fumes of chloride.
Ignition Temperature: Not combustible. **Burning Rate:** Not combustible.

Reactivity

With Water: No reaction.
With Common Materials: Reacts violently with barium, beryllium and lithium.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating = 10 to 100 ppm/96 h/TLm/freshwater; BOD: 5 to 6%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: Known to be concentrated in tissue.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Response

Keep non-involved people away from spill site. Issue warning: "POISON". Avoid contact and inhalation. Notify manufacturer or supplier. Shut off leak if safe to do so. Dike to contain material. Notify environmental authorities.

Protective Clothing and Equipment

In fires or enclosed spaces, Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Otherwise, outer protective clothing as required.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used on fires involving perchloroethylene. Water may be used to cool fire-exposed containers. When heated to decomposition, emits toxic fumes of chlorides.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give conscious victim plenty of water to drink; do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Adsorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

PHENOL C_6H_5OH

IDENTIFICATION

UN No. Solid 1671

Common Synonyms	Observable Characteristics	Manufacturers
CARBOLIC ACID OXYBENZENE HYDROXYBENZENE PHENIC ACID PHENYLIC ACID PHENYL HYDROXIDE	White to pink solid. Liquid at temperatures above 41°C. Sharp, medicinal, sweet, tarry odour.	Gulf Oil Canada Ltd., Montreal, Quebec. Dow Chemical Canada Inc., Delta, B.C.

Transportation and Storage Information

Shipping State: Solid or liquid (molten). **Classification:** Poison. **Inert Atmosphere:** No requirement. **Venting:** Pressure-vacuum.	**Label(s):** White label - POISON; Class 6.1, Group II. **Storage Temperature:** Ambient, solid; 54°C, molten.	**Grades or Purity:** Technical: 82 to 92%, containing cresol. **Containers and Materials:** Drums, tank cars, tank trucks; stainless steel, lined carbon steel, nickel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid. **Solubility (Water):** In all proportions at 66°C; 8.2 g/100 mL (15°C). **Molecular Weight:** 94.1 **Vapour Pressure:** 0.2 mm Hg (20°C); 0.35 mm Hg (25°C); 1 mm Hg (40°C). **Boiling Point:** 182°C.	**Floatability (Water):** Floats and mixes. **Odour:** Sharp, medicinal, sweet, tarry. (0.005 to 0.5 ppm odour threshold). **Flash Point:** 85°C (o.c.), 79°C (c.c.). **Vapour Density:** 3.2 **Specific Gravity:** 1.07 (20°C).	**Colour:** White to pink. **Explosive Limits:** 1.8 LEL. **Melting Point:** 41°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of the nose, mouth, throat, difficulty breathing, headache, nausea, weakness, serious injury. Contact: skin - readily absorbed, severe burning, inflammation, painful blisters, unconsciousness, death; eyes - stinging, watering, severe burning, loss of vision. Ingestion: irritation and burning in throat, pain in swallowing, intense thirst, abdominal cramps, difficulty breathing, convulsions, coma, death.
Toxicology: Highly toxic by all routes.

TLV®- (skin) 5 ppm; 19 mg/m^3. Short-term Inhalation Limits - (skin) 10 ppm; 38 mg/m^3 for 15 min.	LC_{50} - No information. Delayed Toxicity - Causes liver and kidney damage.	LD_{50} - Oral: rat = 0.414 g/kg LD_{Lo} - Oral: human = 0.14 g/kg

Fire

Fire Extinguishing Agents: Use water spray, carbon dioxide, dry chemical or foam.
Behaviour in Fire: Emits toxic (phenol) vapours when heated.

Ignition Temperature: 715°C.	**Burning Rate:** 3.5 mm/min.

Reactivity

With Water: No reaction; soluble.
With Common Materials: Can react with oxidizing materials. Reacts violently with (aluminum chloride and nitrobenzene), butadiene and calcium hypochlorite. When hot, reacts with aluminum, magnesium, lead and zinc.
Stability: Stable.

Environment

Water: Harmful to aquatic life in very low concentrations. Prevent entry into water intakes and waterways. Aquatic toxicity rating: 10 to 100 ppm/96 h/TLm/freshwater; 23.5 ppm/14 h/shrimp/LC_{50}/saltwater; 9 mg/L/1 h/perch/LC_{50}/freshwater; 46 mg/L/24 h/goldfish/LC_{50}/freshwater; BOD: 140 to 180%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "POISON". Call Fire Department. Notify supplier. Avoid contact and inhalation. Stop or reduce discharge, if this can be done without risk. Dike spill to contain water runoff. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing aparatus and totally encapsulated suit. Boots - rubber. Gloves - rubber.

Fire and Explosion

Use water spray, carbon dioxide, dry chemical or foam to extinguish. Emits toxic phenol vapours when heated.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin and eyes - flush immediately with plenty of water for at least 30 minutes while removing contaminated clothing. Ingestion: give conscious victim water to drink; induce vomiting immediately. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

Sinking

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Floating

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. Skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so and using protective equipment.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Adsorb residual liquid on natural or synthetic sorbents.
7. Remove contaminated soil for disposal.
8. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

PHOSGENE $COCl_2$

IDENTIFICATION

UN No. 1076

Common Synonyms	Observable Characteristics	Manufacturers
CARBONYL CHLORIDE CARBON OXYCHLORIDE CHLOROFORMYL CHLORIDE CARBONIC DICHLORIDE Note: PHOSGENE gas is a common combustion product resulting from the burning of many chlorinated compounds.	Colourless to light yellow gas. Odour sweet/sharp, like newly mown grass in dilute concentrations. Strong and stifling in heavy concentrations.	No Canadian manufacturer. U.S. manufacturers: Allied Chemical, Morristown, N.J. Dow Chemical, Midland, MI Upjohn, Kalamahzoo, MI

Transportation and Storage Information

Shipping State: Liquid (compressed gas). **Classification:** Poison and corrosive. **Inert Atmosphere:** No requirement. **Venting:** Safety relief.	**Label(s):** White label - POISON; Class 2.3. White and black label - CORROSIVE; Class 8. **Storage Temperature:** Ambient.	**Grades or Purity:** Commercial, 99.0%. **Containers and Materials:** Cylinders; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas. **Solubility (Water):** (moisture) Decomposes to produce CO_2 and HCl. **Molecular Weight:** 98.9 **Vapour Pressure:** 568 mm Hg (0°C); 1 215 mm Hg (20°C); 1 418 mm Hg (25°C); 1 672 mm Hg (30°C). **Boiling Point:** 7.6°C.	**Floatability (Water):** Liquid sinks and decomposes to produce CO_2 and HCl. **Odour:** Sweet/sharp, like newly mown grass (dilute) (0.1 to 1.0 ppm odour threshold). Stifling heavy conc.). Sense of smell may be fatigued. **Flash Point:** Not flammable. **Vapour Density:** 3.5 **Specific Gravity:** 1.37 (liquid) (20°C).	**Colour:** Colourless to light yellow. **Explosive Limits:** Not flammable. **Melting Point:** -128°C.

HAZARD DATA

Human Health

Symptoms: Sense of smell may be fatigued, and fail to give warning of concentration. Not immediately irritating, even when fatal concentrations are inhaled. **Inhalation:** Dryness or burning in throat, numbness, chest pain, coughing, difficult breathing, cyanosis, headache, nausea, vomiting, pulmonary edema, shock and possible death. **Contact:** skin - burning and inflammation; eyes - burning.
Toxicology: Highly toxic by inhalation and irritation of eyes and mucous membranes.

TLV®- (inhalation) 0.10 ppm; 0.4 mg/m^3. Short-term Inhalation Limits - No information.	LC_{50} - Inhalation: human = 3 200 mg/m^3. LC_{50} - Inhalation: rat = 50 ppm/30 min. Delayed Toxicity - Symptoms may not appear immediately after exposure.	LD_{50} - No information.

Fire

Fire Extinguishing Agents: Not combustible. Use water spray to cool fire-exposed containers and knock down vapours.
Behaviour in Fire: Not combustible. Toxic, corrosive (CO, CO_2, Cl_2, HCl, $COCl_2$) fumes are produced when heated to decomposition.
Ignition Temperature: Not combustible. **Burning Rate:** Not combustible.

Reactivity

With Water: Decomposes, to form hydrochloric acid and carbon dioxide.
With Common Materials: Reacts violently with aluminum, isopropyl alcohol, potassium and sodium.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. No information on fish toxicities. BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

POISON. CORROSIVE.

Immediate Responses

Keep non-involved people away from spill site. Issue warnings: "POISON; CORROSIVE". Avoid contact. Evacuate area. Call Fire Department. Call manufacturer. Stop discharge if safe to do so. Stay upwind and use water spray to control vapour. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit.

Fire and Explosion

Not combustible. Use water to cool fire-exposed containers and knock down vapours. Toxic, corrosive (CO, CO_2, Cl_2, HCl, $COCl_2$) fumes are produced when heated to decomposition.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration (not mouth-to-mouth method) if breathing has stopped, and oxygen if breathing is laboured. Keep victim warm and maintain absolute rest. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water-Land-Air

1. Contact manufacturer or supplier for advice.
2. Stop or reduce discharge if safe to do so (should only be attempted by an experienced person).
3. Use water spray to control vapours.
4. Notify environmental authorities.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

PHOSPHORIC ACID H_3PO_4

IDENTIFICATION

UN No. 1805

Common Synonyms	Observable Characteristics	Manufacturers
ORTHOPHOSPHORIC ACID	Colourless liquid. Odourless.	International Minerals and Chem. Corp., Port Maitland, Ont. Cominco Ltd., Trail and Kimberley, B.C. Esso Chemical Canada, Redwater, Alta. Belledune Fertilizer, Belledune, N.B.

Transportation and Storage Information

Shipping State: Liquid (aqueous solution) or >100 % H_3PO_4
Classification: Corrosive.
Inert Atmosphere: No requirement.
Venting: Open.
Pump Type: Positive displacement, gear, centrifugal; stainless steel.

Label(s): Black and white label - CORROSIVE; Class 8, Group III.
Storage Temperature: Ambient. If >80% may be heated
Hose Type: Polyethylene, butyl, Hypalon.

Grades or Purity: Aqueous solutions from 35 to 85%; 75 and 85% most common; 100% crystalline solid.
Containers and Materials: Carboys, drums, tank cars, tank trucks; stainless 316; rubber-lined tanks.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid (aqueous solution), solid (100%).
Solubility: (Water): Completely soluble. 548 g/100 mL (solute) (20°C); aqueous solutions soluble in all proportions.
Molecular Weight: 98 (solute).
Vapour Pressure: 6.4 mm Hg (21°C) 75%; 2.2 mm Hg (21°C) 85%; 0.0285 mm Hg (20°C) (100%).
Boiling Point: 135°C (75%); 158°C (85%); 260°C (100%); at 213°C decomposes.

Floatability (Water): Sinks and mixes.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: 3.4
Specific Gravity: 1.58 (75%); 1.88 (80%); 1.69 (85%); 1.83 (100%) (20°C).

Colour: Colourless liquid or transparent solid.
Explosive Limits: Not flammable.
Melting Point: 21.1°C (85%); 42°C (100%); -17.5°C (75%), 4.6°C (80%).

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of mucous membranes, watering of eyes, difficulty breathing, salivation, nausea. Ingestion: pain in swallowing, intense thirst, abdominal pain, nausea; Contact: skin - burning, inflammation, blisters; eyes - burning, watering.
Toxicology: Moderately toxic by ingestion and contact.
TLV®- (inhalation) 1 mg/m^3.
Short-term Inhalation Limits - 3 mg/m^3 (15 min).

LC_{50} - No information.
TC_{Lo} - Inhalation: human = 10 mg/m^3.
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 1.53 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Use water in fires involving phosphoric acid. Use water to cool fire-exposed containers and knock down vapours.
Behaviour in Fire: Not combustible. When heated to decomposition, emits toxic POx fumes.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: Soluble with mild exothermic reaction.
With Common Materials: Reacts with some metals to liberate flammable hydrogen gas.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 138 ppm/24 h/mosquito fish/TLm/freshwater; Aquatic toxicity rating = 100 to 1 000 ppm/96 h/TLm/freshwater; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards
CORROSIVE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "CORROSIVE". Avoid contact. Stop or reduce discharge, if this can be done without risk. Contain spill by diking to prevent runoff. Notify supplier and environmental authorities.

Protective Clothing and Equipment

In fires, Respiratory protection - self-contained breathing apparatus protective clothing. Otherwise, Goggles - (mono), tight fitting. Gloves - rubber or plastic coated. Boots - high, rubber (pants worn outside boots).

Fire and Explosion

Not combustible. Use water in fires involving phosphoric acid. Use water to cool fire-exposed containers and knock down vapours. When heated to decomposition, toxic POx fumes are emitted.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin and eyes - remove contaminated clothing and flush skin and eyes with plenty of warm water. Ingestion: give conscious victim water or milk to drink. Keep warm and quiet. If medical assistance is not immediately available, transport victim to hospital doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Neutralize soil with lime.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Neutralization of H_3PO_4 with a suitable alkali (lime) will provide a product which could be buried in a landfill site or placed in other appropriate areas.
3. Contact environmental authorities for advice on disposal.

PHOSPHORUS, RED P_4

IDENTIFICATION

UN No. 1338

Common Synonyms	Observable Characteristics	Manufacturers
AMORPHOUS PHOSPHORUS	Reddish-brown powder. Odourless.	Erco Industries Limited, Long Harbour, Nfld., Varennes, Que.

Transportation and Storage Information

Shipping State: Solid.
Classification: Flammable solid.
Inert Atmosphere: No requirement.
Venting: Open.

Label(s): White and red striped label - FLAMMABLE SOLID; Class 4.1.
Storage Temperature: Ambient.

Grades or Purity: Technical (99.9%).
Containers and Materials: Cans, drums; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): Insoluble in warm water. Extremely low solubility in cold water.
Molecular Weight: 123.9 (P_4).
Vapour Pressure: 1 mm Hg (237°C).
Boiling Point: 280°C (ignites at 202 to 280°C).

Floatability (Water): Sinks.
Odour: Odourless.
Flash Point: No information.
Vapour Density: 4.8
Specific Gravity: 2.2 to 2.3 (20°C).

Colour: Reddish-brown.
Explosive Limits: No information.
Melting Point: Sublimes at 398 to 416°C; melts at 595°C; ignites at 202 to 280°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: (dust) irritation of respiratory tract. Contact: eyes - irritation.
Toxicology: Low toxicity by all routes.
TLV® No information.
Short-term Inhalation Limits - No information.

LC_{50} - No information.
Delayed Toxicity - No information.

LD_{50} - No information.
LD_{Lo} - Oral: man = 4.41 g/kg

Fire

Fire Extinguishing Agents: Use water to extinguish.
Behaviour in Fire: Heat may cause reversion to white (yellow) phosphorus, which is toxic and spontaneously flammable upon contact with air. Burning yields irritating oxides of phosphorus (PO_x).
Ignition Temperature: 202 to 280°C.

Burning Rate: No information.

Reactivity

With Water: No reaction.
With Common Materials: Can react with reducing materials.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity = 0.105 mg/L/48 h/bluegill/TLm/freshwater;
BOD: Not available.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Response

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Stop or reduce discharge, if this can be done without risk. Dike to prevent runoff from rainwater or water application. Notify manufacturer and environmental authorities.

Protective Clothing and Equipment

In fire, Respiratory protection - self-contained breathing apparatus protective clothing. Otherwise, Goggles - (mono), tight fitting. Gloves - rubber.

Fire and Explosion

Use water to extinguish. Heat may cause reversion to white (yellow) phosphorus which is toxic and spontaneously flammable upon contact with air. Burning yields irritating oxides of phosphorus (PO_x).

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin and eyes - remove contaminated clothing and wash eyes and skin thoroughly with plenty of water. Ingestion: give milk or water to conscious victim to drink. Keep warm and quiet. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

PHOSPHORUS, WHITE OR YELLOW P_4

IDENTIFICATION

UN No. 1381

Common Synonyms	Observable Characteristics	Manufacturers
WHITE PHOSPHORUS YELLOW PHOSPHORUS WHITE DRY PHOSPHORUS	White to yellow, waxy solid. Odourless, but POx fumes from combustion have a garlic-like odour.	Erco Industries Limited, Varennes, Que., Long Harbour, Nfld.

Transportation and Storage Information

Shipping State: Solid.
Classification: Spontaneously combustible.
Inert Atmosphere: Water cover.
Venting: Pressure-vacuum.

Label(s): White and red label - SPONTANEOUSLY COMBUSTIBLE; Class 4.2
Storage Temperature: Ambient.

Grades or Purity: Technical, 99.9%.
Containers and Materials: Cans, drums, tank trucks, tank cars (ship under water).

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): 0.0003 g/100 mL (15°C).
Molecular Weight: 123.9 (P_4).
Vapour Pressure: 0.028 mm Hg (21°C).
1 mm Hg (76.6°C).
Boiling Point: 280°C.

Floatability (Water): Sinks.
Odour: Odourless.
Flash Point: Ignites spontaneously in air.
Vapour Density: 4.4
Specific Gravity: 1.82 (20°C).

Colour: White to yellow.
Explosive Limits: No information.
Melting Point: 44°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of respiratory tract, cough, weakness, nausea and vomiting, laboured breathing, anemia. Contact: eyes and skin - may cause severe burns. Ingestion: causes nausea, vomiting, jaundice, delirium, coma and death. Symptoms after ingestion may be delayed from a few hours to 3 days.
Toxicology: Highly toxic by all routes.

TLV®- (inhalation) 0.1 mg/m^3. Short-term Inhalation Limits - 0.3 mg/m^3 (15 min).	LC_{50} - No information. Delayed Toxicity - Severe attack of liver and bones. Symptoms may persist from 5 to 15 days.	LD_{50} - Intraperitoneal: rat = 0.1 g/kg LD_{Lo} - Oral: human = 0.0014 g/kg

Fire

Fire Extinguishing Agents: Flood with water. After fire is extinguished cover with wet sand or dirt. Use extreme caution during cleanup, since reignition may occur.
Behaviour in Fire: Intense white smoke is formed and highly irritating and toxic PO_x fumes are released.
Ignition Temperature: 30°C. **Burning Rate:** No information.

Reactivity

With Water: No reaction.
With Common Materials: Ignites when exposed to air. Reacts vigorously with oxidizing materials. Reacts violently with alkaline hydroxides, halogens, chlorates, iodates, chlorosulfonic acid, nitrates, ammonium nitrate, bromates, bromine, calcium chlorate, cesium, chlorine, chromic acid, chromic anhydride, copper, fluorine, iodine, iron, lead dioxide, lithium, manganese, mercuric oxide, nickel, nitric acid, oxygen, performic acid, platinum, potassium, potassium bromate, potassium chlorate, potassium hydroxide, potassium iodate, potassium permanganate, silver nitrate, sodium, sodium bromate, sodium chlorate, sodium chlorite, sodium hydroxide, sodium iodate, sodium peroxide, sulfur, sulfuric acid, zinc bromate and zinc chlorate.
Stability: Ignites spontaneously on contact with air and is very reactive.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating: <1 ppm/96 h/TLm/freshwater; 0.045 ppm/96 h/bluegill/LC_{50}/freshwater; 0.025 ppm/96 h/Cod/LC_{50}/saltwater.
Land-Air: Oral: duck = 3 mg/kg (6 to 33 hours) LD_{100}.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

SPONTANEOUSLY COMBUSTIBLE. REACTIVE. Ignites spontaneously when exposed to air.

Immediate Responses

Keep non-involved people away from spill site. Issue warnings: "FLAMMABLE; POISON". Call Fire Department. Call manufacturer. Stop or reduce discharge, if this can be done without risk. Dike area of spill and cover with water. Notify environmental authorities.

Protective Clothing and Equipment

In fires or confined spaces, Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Otherwise, Goggles - (mono), tight fitting. If face shield is used, it must not replace goggles. Gloves - rubber. Boots - high, rubber (pants worn outside boots). Fire-resistant clothing (coveralls, suit, apron, etc.).

Fire and Explosion

Flood discharge area with water (after diking). When fire is extinguished, cover with wet sand or earth. Cover fires with water spray, dry chemical, sand or earth. Use water to cool fire-exposed containers. Highly irritating and toxic PO_x fumes are released.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid immediately. Inhalation: if breathing has stopped give artificial respiration; if laboured, give oxygen. Contact: immediately flush skin and eyes with plenty of water while removing contaminated clothing. Keep skin area wet until medical attention is obtained. Ingestion: if victim is conscious, give plenty of milk or water to drink and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
Note: material requires special handling because of its spontaneous ignition in air.
Spilled material should be covered at all times with wet sand or dirt.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manfacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

PHOSPHORUS PENTASULFIDE $(P_2S_5)_2$

IDENTIFICATION

UN No. 1340

Common Synonyms	Observable Characteristics	Manufacturers
TETRAPHOSPHORUS DECASULPHIDE PHOSPHORIC SULPHIDE PHOSPHORUS PERSULFIDE THIOPHOSPHORIC ANHYDRIDE PHOSPHORUS SULPHIDE	Yellow to green solid. Hydrogen sulfide-like (rotten eggs) odour.	No Canadian manufacturer. Selected U.S. manufacturer: Hooker Industrial Chemicals Division, Niagara Falls, N.Y., USA.

Transportation and Storage Information

Shipping State: Solid.
Classification: Flammable.
Inert Atmosphere: No requirement.
Venting: Closed.

Label(s): Red and white striped label - FLAMMABLE SOLID; Class 4.1, Group II.
Storage Temperature: Ambient.

Grades or Purity: Regular and reactive, 99+%.
Containers and Materials: Cans, fibre or steel drums and tote bins.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): Reacts evolving H_2S and forming soluble phosphorus compounds.
Molecular Weight: (P_4S_{10}) 444.5
Vapour Pressure: 1 mm Hg (300°C).
Boiling Point: 513 to 515°C.

Floatability (Water): Sinks and reacts, toxic H_2S gas evolved.
Odour: Rotten-eggs (0.00021 to 0.00047 ppm as H_2S, odour threshold).
Flash Point: Data not available but autoignition temperatures as dust; 260 to 290°C, and liquid; 275°C (approx.).
Vapour Density: No information.
Specific Gravity: 2.03 (17°C).

Colour: Yellow to green.
Explosive Limits: Dust can be explosive in certain concentrations. Can be ignited by friction.
Melting Point: 275 to 290°C.

HAZARD DATA

Human Health

Symptoms: Contact of phosphorus pentasulfide with water or moisture produces H_2S which is highly toxic (see hydrogen sulfide). Inhalation: dizziness, headache, fatigue, difficulty breathing, irritation of respiratory tract. Contact: skin - irritation and burning; eyes - irritation and burning. Ingestion: produces symptoms similar to inhalation; however ingestion is extremely serious, as H_2S is formed.
Toxicology: Highly toxic by all routes.
TLV - (Inhalation) 1 mg/m^3.
Short-term Inhalation Limits - 3 mg/m^3 (15 min).

LC_{50} - Inhalation: rat = 713 ppm/1 h (as H_2S).
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 0.39 g/kg

Fire

Fire Extinguishing Agents: Carbon dioxide, dry chemical, sand.
Behaviour in Fire: When heated to decomposition, emits highly toxic SO_x and PO_x fumes. Reacts with water or moisture to produce toxic H_2S and P_2O_5 vapours. In contact with moisture, may ignite organic materials.
Ignition Temperature: Dust, 260 to 290°C; liquid, 275°C.
Burning Rate: No information.

Reactivity

With Water: Reacts with water exothermically producing H_2S gas and soluble phosphorus compounds (primarily P_2O_5). Can ignite spontaneously from heat of reaction with limited amount of moisture.
With Common Materials: Reacts with acids in a similar manner to water. Can react vigorously with oxidizing materials.
Stability: Stable (within the limits of the foregoing).

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 1.38 ppm/48 h/fathead minnow/TLm/freshwater (as H_2S).
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE. CONTACT WITH WATER RELEASES TOXIC AND POISONOUS H_2S AND P_2O_5 GASES. MAY IGNITE IN PRESENCE OF MOISTURE.

Immediate Response

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE. POISONOUS AND REACTIVE WITH WATER". Call fire department (describe unusual properties - NO WATER). Evacuate area. Contact manufacturer for guidance and assistance. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Gloves - rubber, neoprene or vinyl. Boots - high, rubber (pants worn outside boots).

Fire and Explosion

Use carbon dioxide, dry chemical or sand to extinguish. When heated to decomposition, emits highly toxic fumes of SO_x and PO_x. Reacts with water or moisture to produce toxic H_2S and P_2O_5 vapours. In contact with moisture, may ignite organic materials.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Contact: eyes and skin - flush affected areas with plenty of water. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Ingestion: give conscious victim water to drink and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove materials by manual or mechanical means. Caution must be observed when handling this material.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

PHOSPHORUS TRICHLORIDE PCl_3

IDENTIFICATION

UN No. 1809

Common Synonyms	Observable Characteristics	Manufacturers
PHOSPHORUS CHLORIDE CHLORIDE OF PHOSPHORUS	Colourless to slightly yellow liquid. Fumes on contact with air. Pungent, irritating, HCl-like odour.	No Canadian manufacturer. Selected U.S. manufacturer: Hooker Industrial Chemicals Division, Niagara Falls, NY, USA

Transportation and Storage Information

Shipping State: Liquid.
Classification: Corrosive.
Inert Atmosphere: No requirement.
Venting: Pressure-vacuum.
Pump Type: Gear, centrifugal.
Note: PCl_3 is corrosive to steel.

Label(s): White and black label - CORROSIVE; Class 8, Group II.
Storage Temperature: Ambient.
Hose Type: Nickel-lined stainless steel.

Grades or Purity: Technical, 98.5% PCl_3 min.
Containers and Materials: Drums, tank cars, tank trucks; nickel-lined stainless steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): Reacts to produce HCl and PH_3.
Molecular Weight: 137.3
Vapour Pressure: 100 mm Hg (21°C).
Boiling Point: 74.2 to 76.1°C.

Floatability (Water): Sinks and reacts violently with water to produce HCl and PH_3 acids.
Odour: Pungent (like HCl).
Flash Point: Not flammable.
Vapour Density: 4.8
Specific Gravity: 1.57 (20°C).

Colour: Colourless to slightly yellow.
Explosive Limits: Not flammable.
Melting Point: -112°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: sore throat, coughing, laboured breathing, dizziness, headache. Contact: skin - burning and inflammation; eyes - burning. Ingestion: irritation, nausea, vomiting, burning.
Toxicology: Highly toxic by all routes.
TLV - (inhalation) 0.2 ppm; 1.5 mg/m^3.
Short-term inhalation Limits - 0.5 ppm; 3 mg/m^3 (15 min).

LC_{50} - Inhalation: rat = 104 ppm/4 h
LC_{50} - Inhalation: guinea pig = 50 ppm/4 h
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 0.55 g/kg

Fire

Fire Extinguishing Agents: Use carbon dioxide or dry chemical.
Behaviour in Fire: When heated to decomposition, emits highly toxic chloride and PO_x fumes. Reacts with water or moisture to produce HCl and PH_3.
Ignition Temperature: No information.
Burning Rate: No information.

Reactivity

With Water: Reacts violently and exothermically with water or moisture producing HCl and PH_3.
With Common Materials: Reacts with oxidizing materials. Reacts violently with acetic acid, aluminum, dimethyl sulfoxide, fluorine, hydroxylamine, lead dioxide, nitric acid, nitrous acid, organic matter, potassium and sodium.
Stability: Stable (within the limits of the foregoing).

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating = 10 to 100 ppm/96 h/TLm/freshwater; BOD: Not available.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE. REACTIVE WITH WATER.

Immediate Response

Keep non-involved people away from spill site. Issue warning: "CORROSIVE". Call Fire Department (describe unusual properties - NO WATER). Contact manufacturer for guidance, and assistance if possible. Avoid contact and inhalation. Contain spill area by diking. Stop or reduce discharge if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Gloves - rubber. Boots - rubber, high (pants worn outside boots).

Fire and Explosion

Use carbon dioxide or dry chemical to extinguish. When heated to decomposition, emits highly toxic chloride and PO_x fumes. Reacts with water or moisture to produce HCl and PH_3.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Contact: skin and eyes - immediately flush with large amounts of water and remove contaminated clothing. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Ingestion: dilute concentration of chemical by giving water or milk to conscious victim to drink. Do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means. Caution is required when handling materials.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

PHTHALIC ANHYDRIDE $C_6H_4(CO)_2O$

IDENTIFICATION

UN No. 2214

Common Synonyms	Observable Characteristics	Manufacturers
PHTHALANDIONE PHTHALIC ACID ANHYDRIDE PAN 1,3 - ISOBENZOFURANDIONE 1,2 - BENZENEDICARBOXYLIC ACID ANHYDRIDE	White powder or crystals. Choking odour.	BASF Canada, Cornwall, Ontario.

Transportation and Storage Information

Shipping State: Solid. **Classification:** Corrosive. **Inert Atmosphere:** No requirement. **Venting:** Open (flame arrester).	**Label(s):** Black and white label - CORROSIVE; Class 8, Group III. **Storage Temperature:** Ambient.	**Grades or Purity:** Commercial, 99.8%. **Containers and Materials:** Multiwall paper bags, drums.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid. **Solubility (Water):** 1g/100mL (20°C); **Molecular Weight:** 148.1 **Vapour Pressure:** 0.0002 mm Hg (20°C); 0.001 mm Hg (30°C). **Boiling Point:** Sublimes 284.5°C.	**Floatability (Water):** Sinks. **Odour:** Choking (0.32 to 0.72 mg/m^3, odour threshold). **Flash Point:** 152°C (c.c.). **Vapour Density:** 5.1 **Specific Gravity:** 1.53 (20°C).	**Colour:** White. **Explosive Limits:** 1.7 to 10.5%. **Melting Point:** 130 to 132°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: sore throat, irritation of nose, eyes and respiratory tract, coughing, difficulty breathing, cyanosis. Contact: skin - itching, irritation, inflammation, brown staining; eyes - stinging, watering, inflammation. Ingestion: burning sensation, stomach cramps, nausea and vomiting, general weakness, dizziness, diarrhea, shock, convulsions, coma.

Toxicology: Moderately toxic by ingestion. TLV® - 1 ppm, 6 mg/m^3. Short-term Inhalation Limits - 4 ppm; 24 mg/m^3 (15 min).	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - Oral: rat = 4.02 g/kg

Fire

Fire Extinguishing Agents: Use carbon dioxide and/or dry chemical. Water or foam may cause frothing.

Behaviour in Fire: No information. **Ignition Temperature:** 570°C.	**Burning Rate:** No information.

Reactivity

With Water: Slowly reacts to form benzoic acid.
Stability: Reacts violently with nitric acid.
With Common Materials: Stable.

Environment

Water: Prevent entry into potable water intakes. Harmful to aquatic life. Aquatic toxicity rating = 10 to 100 ppm/96 h/TLm/freshwater; Fish toxicity: 756 ppm/96 h/fathead minnow/TLm/freshwater; BOD: 72 to 102%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "CORROSIVE". Call Fire Department. Avoid contact and inhalation. Notify manufacturer or supplier. Dike to contain runoff. Notify environmental authorities.

Protective Clothing and Equipment

In fires or confined spaces - Respiratory Protection - self-contained breathing apparatus and totally encapsulated suit. Otherwise, protective outer clothing as required.

Fire and Explosion

Use carbon dioxide or dry chemical to extinguish. Water or foam may cause frothing.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give conscious victim plenty of water to drink and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor, or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

POLYCHLORINATED BIPHENYLS $C_{12}H_{10-x}Cl_x$

IDENTIFICATION

UN No. 2315

Common Trade Names or Synonyms	Observable Characteristics	Manufacturers
PCBs AROCHLOR ASKAREL PYRANOL INERTEEN	Clear to pale yellow mobile liquids and some solids. Weak, bitter odour.	Previous Canadian supplier: Monsanto Canada Limited, Mississauga, Ont. (PCBs no longer being manufactured)

Transportation and Storage Information

Shipping State: Liquid or solid. **Classification:** Environmentally dangerous substance. **Inert Atmosphere:** No requirement. **Venting:** Open. **Pump Type:** Most centrifugal types except those with rubber, neoprene, butyl rubber or PVC.	**Label(s):** Black and white label - POISON; Class 9.2. **Storage Temperature:** Ambient. **Hose Type:** Most types, except rubber, neoprene, butyl rubber or PVC. These should not be used after coming in contact with PCBs.	**Grades or Purity:** 11 grades (some liquid, some solid) which differ primarily in their chlorine content (20-68% by weight). **Containers and Materials:** Drums. Electrical equipment.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid or solid. **Solubility** (Water): Low; 0.001 mg/100 mL (freshwater); 0.0004 mg/100 mL (saltwater). **Molecular Weight:** Variable; 327 (average). **Vapour Pressure:** 0.006 mm Hg (25°C) (Arochlor 1016); 0.001 mm Hg (0°C); 29 mm Hg (200°C).	**Floatability** (Water): Sinks. **Odour:** Weak and bitter (odour threshold <0.5 mg/m^3). **Flash Point:** Greater than 140°C. **Vapour Density:** No information. **Specific Gravity:** 1.3 to 1.5 (20°C). **Boiling Point:** 360 to 390°C.	**Colour:** Colourless, to pale yellow. **Explosive Limits:** Not flammable. **Melting Point:** No information.

HAZARD DATA

Human Health

Symptoms: Skin Contact and Ingestion: small pimples, dark pigmentation of exposed areas, followed by blackheads and postules. Inhalation and Ingestion: nausea, vomiting, loss of weight, jaundice, edema, abdominal pain, possible coma and death.
Toxicology: Severely toxic and irritating. The higher the chlorine content of the compound, the more toxic it is.

TLV®- (skin) 0.5 mg/m^3 (54% chlorine) 42% chlorine = 1.0 mg/m^3. **Short-term Inhalation Limits** - (skin) 2.0 mg/m^3 (15 min) (42% Cl); 1.0 mg/m^3 (15 min) (54% Cl).	LC_{50} - No information. TC_{Lo} - Inhalation: human = 12 mg/m^3 Arochlor 1242 (42% chlorine) Delayed Toxicity - Possible carcinogen; adverse reproductive effects and atrophy of the liver.	LD_{50} - Oral: rat = 4.47 g/kg Arochlor 1232 (32% chlorine). LD_{50} - Oral: rat = 4.25 g/kg Arochlor 1242 (42% chlorine). LD_{50} - Oral: rat = 1.32 g/kg Arochlor 1260 (60% chlorine).

Fire

Fire Extinguishing Agents: Water, foam, dry chemical or carbon dioxide. Use water only if safe to do so.
Behaviour in Fire: Highly toxic, irritating gases (chlorides and chlorine) can be evolved.
Ignition Temperature: ~1000°C. **Burning Rate:** No information.

Reactivity

With Water: No reaction. **With Common Materials:** Reacts with liquid chlorine. **Stability:** Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life in very low concentrations. Fish toxicity: 0.278 mg/L/96 h/bluegill/TLm/freshwater; 0.005 ppm/336-1 080 h/pinfish/TLm/saltwater; EPA Criterion: 0.0015 µg/L/24 h av./conc. should not exceed 6.2 µg/L (freshwater); 0.024 µg/L/24 h/conc. should not exceed 0.2 µg/L (saltwater); BOD: Very low.
Land-Air: LD_{50}: 2 000 ppm (mallard duck).
Food Chain Concentration Potential: Known to accumulate in fatty tissue.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "POISON". Call Fire Department. Avoid contact and inhalation. Contact supplier. Stop or reduce discharge if this can be done without risk. Contain any spillage. Notify environmental authorities.

Protective Clothing and Equipment

In fires, Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Goggles, Boots - polyethylene, neoprene, Viton. Note: contaminated clothing should be disposed of in same manner as PCBs.

Fire and Explosion

Use water, foam, dry chemical or carbon dioxide to extinguish fires. Use water only if safe to do so. In fire, toxic gases (chlorides and chlorine) can be evolved.

First Aid

Move victim out of spill area to fresh air. Call for doctor, but start first aid at once. Contact - using appropriate gloves, remove contaminated clothing. Clothing should be disposed of in the same manner as PCBs. Wash eyes and affected skin thoroughly with plenty of water. Ingestion: have conscious victim rinse mouth with water. Keep victim warm and quiet. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Notify environmental authorities immediately.
2. Stop or reduce discharge if safe to do so.
3. Contact manufacturer or supplier for advice.
4. If possible, contain discharge by damming or water diversion.
5. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Notify environmental authorities immediately.
2. Stop or reduce discharge if safe to do so.
3. Contact manufacturer or supplier for advice.
4. Contain spill by diking with earth or other barrier.
5. Remove material with pumps or vacuum equipment and place in appropriate containers.
6. Remove material by manual or mechanical means.
7. Absorb residual liquid on natural or synthetic sorbents.
8. Remove contaminated soil for disposal.
9. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

POTASH (POTASSIUM CHLORIDE) KCl

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
POTASSIUM MURIATE MURIATE OF POTASH	Colourless to whitish-pink crystals. Odourless.	International Minerals and Chemicals, Esterhazy, Saskatchewan. Potash Corporation of Saskatchewan, Rocanville, Saskatchewan. Kalium Chemicals, Belle Plaine, Saskatchewan. Allan Potash Mines, Saskatoon, Saskatchewan.

Transportation and Storage Information

Shipping State: Solid
Classification: None.
Inert Atmosphere: No requirement.
Venting: Open.

Label(s): Not regulated.
Storage Temperature: Ambient.

Grades or Purity: Industrial.
Containers and Materials: Multiwall paper bags. Bulk by truck or train; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): 23.8 g/100 mL (20°C); 56.7 g/100 mL (100°C).
Molecular Weight: 74.6
Vapour Pressure: No information.
Boiling Point: 1420 to 1500°C (sublimes).

Floatability (Water): Sinks and mixes.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: 1.99 (20°C).

Colour: Colourless to whitish-pink.
Explosive Limits: Not flammable.
Melting Point: 770°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: slight irritation of nose, sneezing. Ingestion: nausea and vomiting. Contact: skin - irritation and inflammation; eyes - irritation, inflammation and watering.
Toxicology: Low toxicity by all routes.
TLV® - No information.
Short-term Inhalation Limits - No information.

LC_{50} - No information.
Delayed Toxicity - No information.

LD_{50} - Oral: mouse = 0.383 g/kg
LD_{50} - Oral: guinea pig = 2.5 g/kg
LD_{50} - Oral: infant = 0.938 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used on fires involving potash.
Behaviour in Fire: Not combustible.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: No reaction; soluble.
Stability: Reacts violently with bromine trifluoride and (potassium permanganate and sulfuric acid).
With Common Materials: Stable.

Environment

Water: Prevent entry into water intakes and waterways.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from spill site. Notify manufacturer or supplier. Dike to prevent runoff from rainwater or water application. Notify environmental authorities.

Protective Clothing and Equipment

Outer protective clothing as required.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used on fires involving potash.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give conscious victim plenty of water to drink and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

POTASSIUM CARBONATE K_2CO_3

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
SALT OF TARTAR PEARL ASH POTASH (laboratory usage)	White powder. Odourless.	

Transportation and Storage Information

Shipping State: Solid. **Classification:** None. **Inert Atmosphere:** No requirement. **Venting:** Open.	**Label(s):** Not regulated. **Storage Temperature:** Ambient.	**Grades or Purity:** Calcined 80 to 85%, 85 to 90%, 90 to 95%, 96 to 99%; hydrated 80 to 85%. **Containers and Materials:** Multiwall paper bags, kegs, drums; bulk by train.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid. **Solubility (Water):** 112 g/100 mL (20°C); 156 g/100 mL (100°C). **Molecular Weight:** 138.2 **Vapour Pressure:** No information. **Boiling Point:** Decomposes, 891°C.	**Floatability (Water):** Sinks and mixes. **Odour:** Odourless. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** 2.43 (20°C).	**Colour:** White. **Explosive Limits:** Not flammable. **Melting Point:** 891°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of nose, eyes and throat, sneezing, difficulty breathing, coughing; Contact: skin - itching, burning and inflammation; eyes - pain, watering. Ingestion: burning sensation, pain, stomach cramps, nausea and vomiting.
Toxicology: Moderately toxic by ingestion. Low toxicity by inhalation and contact.

TLV® No information. Short-term Inhalation Limits - No information.	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - Oral: rat = 1.87 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used on fires involving potassium carbonate.
Behaviour in Fire: Not combustible.

Ignition Temperature: Not combustible.	**Burning Rate:** Not combustible.

Reactivity

With Water: No reaction; soluble.
With Common Materials: Reacts violently with chlorine trifluoride.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

CORROSIVE.

Immediate Responses

Keep non-involved people away from spill site. Call Fire Department. Avoid contact and inhalation. Notify manufacturer or supplier. Dike to prevent runoff. Notify environmental authorities.

Protective Clothing and Equipment

Protective outer clothing as required. Boots - high rubber.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used on fires involving potassium carbonate.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give water to conscious victim to drink, do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

POTASSIUM HYDROXIDE KOH

IDENTIFICATION

UN No. 1813 solid
1814 liquid

Common Synonyms	Observable Characteristics	Manufacturers	
CAUSTIC POTASH POTASSIUM HYDRATE LYE POTASSA	45% KOH solution: Clear, colourless liquid. Odourless. Solid KOH: White solid. Odourless.	Canadian manufacturer: C-I-L Cornwall, Ontario. Canadian supplier: C-I-L Toronto, Ontario. Canada Colours and Chemicals Ltd., Toronto, Ontario. Hooker Chemical, Calgary, Alta. Canadian Occidental Petroleum, Calgary, Alberta.	Originating from: International Minerals and Chemical, USA Hooker Chemical, USA

Transportation and Storage Information

Shipping State: Solid, liquid (aqueous solution).
Classification: Corrosive.
Inert Atmosphere: No requirement.
Venting: Open.
Pump Type: Gear, centrifugal; steel, stainless steel (solutions).

Label(s): White and Black label - CORROSIVE, Class 8, Group II.
Storage Temperature: Ambient.
Hose Type: Natural rubber, polyethylene, polypropylene, Chemiflex 951 (solutions).

Grades or Purity: Solution, 45% KOH, solid, 88 to 92% KOH (ground, flakes, pellets, sticks, lumps).
Containers and Materials: Solutions - drums, tank cars, tank trucks; steel.
Solid - cans and drums (steel).

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): 107 g/100 mL (15°C); 178 g/100 mL (100°C).
Molecular Weight: 56.1
Vapour Pressure: 1 mm Hg (719°C).
Boiling Point: 133°C, (45% KOH); 1320°C (Solid KOH).

Floatability (Water): Mixes readily and sinks.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: 1.46, 45% liquid KOH (15.5°C); 2.04, solid (20°C).

Colour: Liquid - colourless, clear.
Solid - white.
Explosive Limits: Not flammable.
Melting Point: 45% solution KOH, -30°C; Solid, 360-380°C (depending on water content).

HAZARD DATA

Human Health

Symptoms: Contact with solutions can result in severe burns. KOH is a strong irritant. Contact: skin - burns; eyes - burns, severe damage. Inhalation: (of dust or mist) may damage upper respiratory tract and even lung tissue. Ingestion: can result in severe damage to mucous membranes, nausea, vomiting and diarrhea.
Toxicology: Highly toxic by ingestion and inhalation.
TLV® (inhalation) 2 mg/m^3.
Short-term Inhalation Limits - No information.
LC_{50} - No information.
Delayed Toxicity - No information.
LD_{50} - Oral: rat = 0.365 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used on fires involving KOH. Use water only in flooding amounts.
Behaviour in Fire: Not combustible. Solid KOH in contact with water may generate sufficient heat to ignite combustible material. May cause ignition on contact with organic chemicals.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: Dissolves exothermically.
With Common Materials: When wet may attack aluminum, tin, lead and zinc to generate H_2 gas. Reacts violently with acetic acid, acrolein, acrylonitrile, 1,2-dichloroethylene, maleic anhydride, nitroethane, nitromethane, nitropropane, nitrophenol, N-nitrosomethylurea, phosphorus, tetrachloroethane, tetrahydrofuran and trichloroethylene.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 80 ppm/24 h/mosquito fish/TLm/freshwater; Aquatic toxicity rating = 10 to 100 ppm/96 h/TLm/freshwater; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "CORROSIVE". Call Fire Department. Contain spill by diking with earth or other available material. Contact manufacturer for guidance. Avoid contact and inhalation. Stop or reduce discharge, if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - filter or dust type respirators are normally sufficient protection against dusts and mists. Goggles - (mono), tight fitting. If face shield used, it must not replace goggles. Gloves - rubber. Boots - high, rubber (pants worn outside boots). Outerwear - as required, coveralls, aprons.

Fire and Explosion

Most fire extinguishing agents may be used. Water should be used only in flooding amounts.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: eyes - irrigate with plenty of water; flush with plenty of water while removing contaminated clothing. Ingestion: give large quantities of milk or water to conscious victim to drink. Do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. If possible, dredge or vacuum pump to remove contaminants, liquid and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undammaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

POTASSIUM SULFATE K_2SO_4

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
	White powder or crystals; odourless.	Potash Corp. of Saskatchewan, Cory, Sask. Potcal, Parry Sound, Ontario. Shamrock Chemicals, Port Stanley, Ontario.

Transportation and Storage Information

Shipping State: Solid. **Classification:** None. **Inert Atmosphere:** No requirements. **Venting:** Open.	**Label(s):** Not regulated. **Storage Temperature:** Ambient.	**Grades or Purity:** Commercial; technical. **Containers and Materials:** Bags, drums. Bulk by truck or rail.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid. **Solubility** (Water): 8.5 g/100 mL H_2O (10°C) 10.0 g/100 mL (20°C); 14.2 g/100 mL (50°C). **Molecular Weight:** 174.3 **Vapour Pressure:** No information. **Boiling Point:** 1 689°C.	**Floatability** (Water): Sinks and slowly mixes. **Odour:** Odourless. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** 2.7	**Colour:** White. **Explosive Limits:** Not flammable. **Melting Point:** 1 069 to 1 072°C, undergoes transition at 588°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of nose and eyes. Ingestion: stomach pains; Contact: skin - irritation, eyes - irritation.
Toxicology: Low toxicity by all routes.

TLV® No information. Short-term Inhalation Limits - No information.	LC_{50} - No information. Delayed Toxicity - No information.	LD_{Lo} - Oral: human = 0.80 g/kg LD_{Lo} - Scutaneous: guinea pig = 3.0 g/kg

Fire

Fire Extinguishing Agents: Not combustible; most fire extinguishing agents may be used in fires involving potassium sulfate.
Behaviour in Fire: Not combustible.

Ignition Temperature: Not combustible.	**Burning Rate:** Not combustible.

Reactivity

With Water: No reaction; slightly soluble.
With Common Materials: May react with finely-divided aluminum under certain circumstances.
Stability: Stable.

Environment

Water: Prevent entry into water intakes or waterways.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from spill site. Stop or reduce discharge if this can be done without risk. Notify supplier and environmental authorities.

Protective Clothing and Equipment

Protective outerwear as required.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used in fires involving potassium sulfate.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Contact: skin and eyes - remove contaminated clothing and flush affected areas with plenty of water. Ingestion: give conscious victim plenty of water to drink. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, contaminated liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other material.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Material may be buried in a sanitary landfill (environmental authorities' approval required).

PROPANE $CH_3CH_2CH_3$

IDENTIFICATION

UN No. 1978

Common Synonyms	Observable Characteristics	Manufacturers
LPG (see also Butane) DIMETHYLMETHANE	Colourless gas. Odourless when pure.	Superior Propane Ltd., Toronto, Ont. Consumers Co-op Refineries Ltd., Regina, Sask. Dome Petroleum Ltd., Calgary, Alta. Goliad Oil Canada Ltd., Calgary, Alta. Mobil Oil Canada Ltd., Calgary, Alta. Pacific Petroleums Ltd., Calgary, Alta. Home Oil Ltd., Calgary, Alta.

Transportation and Storage Information

Shipping State: Liquid (compressed gas). **Classification:** Flammable gas. **Inert Atmosphere:** No requirement. **Venting:** Safety relief. **Pump Type:** Rotary LPG.	**Label(s):** Red label - FLAMMABLE GAS. **Storage Temperature:** Ambient. **Hose Type:** LPG type; reinforced high pressure.	**Grades or Purity:** Commercial, technical 97.5%. **Containers and Materials:** Cylinders tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas. **Solubility (Water):** Slight, 0.012 g/100 mL (17.8°C). **Molecular Weight:** 44.1 **Vapour Pressure:** 400 mm Hg (-56°C); 6 400 mm Hg (21°C). **Boiling Point:** -42.1°C.	**Floatability (Water):** Liquefied propane floats and boils. **Odour:** Odourless when pure, added mercaptans give 500 to 20 000 ppm, odour threshold, natural gas odour. **Flash Point:** -104°C (c.c.). **Vapour Density:** 1.5 (20°C). **Specific Gravity:** (liquid) 0.58 (-44°C).	**Colour:** Colourless. **Explosive Limits** 2.1 to 9.5%. **Melting Point:** -187.7° to 189.9°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: asphyxiant; rapid irregular breathing, headache, fatigue, nausea and vomiting, convulsions, loss of consciousness; Contact: skin and eyes - with propane liquified causes frostbite, burning sensation.
Toxicology: An asphyxiant. Low toxicity.

TLV® (inhalation) Asphyxiant. Short-term Inhalation Limits - No information.	LC_{50} - Human: no effect 10 000 ppm brief exposures; slight dizziness in a few minutes at 100 000 ppm. Delayed Toxicity - No information.	LD_{50} - No information.

Fire

Fire Extinguishing Agents: Stop or reduce discharge if safe to do so. Do not attempt to extinguish fire until leak has been shut off. Use water spray to cool tanks exposed to fire.
Behaviour in Fire: When exposed to heat and flame, containers may rupture. Flash back may occur along vapour trail.
Ignition Temperature: 432°C. **Burning Rate:** 8.2 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Reacts vigorously with strong oxidizing agents. Reacts violently with chlorine dioxide.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating > 1 000 ppm/96 h/TLm/freshwater.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all ignition sources. Contact supplier or manufacturer. Flash back may occur along vapour trail. Do not attempt to extinguish fire until leak has been shut off. Contact environmental authorities.

Protective Clothing and Equipment

In fire or confined spaces - Respiratory protection - self-contained breathing apparatus. Goggles - (mono), tight fitting should be worn, to protect from liquid propane, which could cause eye injury from frostbite burn.

Fire and Explosion

Stop or reduce discharge if safe to do so. Do not attempt to extinguish fire until leak has been controlled. Let fire burn. Use water spray to cool fire-exposed containers.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped give artificial respiration; if laboured, give oxygen. Contact: eyes and skin-if exposed to liquid propane, immediately remove contaminated clothing irrigate eyes and flush skin with water. Treat as for frostbite. Do not rub affected areas. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water	Land-Air
1. Stop or reduce discharge if safe to do so. 2. Contact manufacturer or supplier for advice. 3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.	1. Stop or reduce discharge if safe to do so. 2. Contact manufacturer or supplier for advice. 3. Recover undamaged containers. 4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Burn or flare at spill site (under knowledgeable supervision).

PROPYLENE $CH_3CH{:}CH_2$

IDENTIFICATION

UN No. 1077

Common Synonyms	Observable Characteristics	Manufacturers
PROPENE METHYLETHYLENE METHYLETHENE	Colourless gas. Mild, aromatic odour.	Petrosar Limited, Corunna, Ont. Esso Chemical Canada, Sarnia, Ont. Petromont, Varennes, Que.

Transportation and Storage Information

Shipping State: Liquid (compressed gas).
Classification: Flammable gas.
Inert Atmosphere: No requirement.
Venting: Safety relief.
Pump Type: Rotary LPG.

Label(s): Red label - FLAMMABLE GAS.
Storage Temperature: Ambient.
Hose Type: LPG types reinforced high pressure.

Grades or Purity: Technical min. 95%; Pure min. 99%.
Containers and Materials: Cylinders, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas.
Solubility (Water): 0.02 g/100 mL (20°C).
Molecular Weight: 42.1
Vapour Pressure: 7600 mm Hg (20°C); 400 mm Hg (-61°C); 3800 mm Hg (-5°C).
Boiling Point: -47.7°C.

Floatability (Water): Liquid floats and boils.
Odour: Mild, aromatic (22.5 to 67.6 ppm, odour threshold).
Flash Point: -108°C (c.c.).
Vapour Density: 1.5 (20°C).
Specific Gravity: (liquid) 0.51 (-48°C).

Colour: Colourless.
Explosive Limits: 2.0 to 11.1%.
Melting Point: -185.2°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: asphyxiant, headache, fatigue, mental confusion, nausea and vomiting, convulsions, loss of consciousness. Contact: skin and eyes - with liquified, may cause frostbite.
Toxicology: Low toxicity. Asphyxiant.
TLV® Asphyxiant.
Short-term Inhalation Limits - No information.

LC_{50} - No information.
Delayed Toxicity - No information.

LD_{50} - No information.

Fire

Fire Extinguishing Agents: Stop or reduce discharge if safe to do so. Do not attempt to extinguish fire until leak has been shut off. Use water to cool fire-exposed containers.
Behaviour in Fire: Exposed containers may rupture.
Ignition Temperature: 455°C.

Flash back may occur along vapour trail.
Burning Rate: 8 mm/min (liquid).

Reactivity

With Water: No reaction.
With Common Materials: Can react vigorously with oxidizing materials. Reacts violently with nitrogen dioxide, nitrogen tetroxide, nitrous oxide.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating >1 000 ppm/96h/TLm/freshwater;
Land-Air: Sweet pea: declination in seedlings, 1000 ppm, 3 days; tomato: 50 ppm, 2 days growth deformation of petiole.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all sources of ignition. Contact supplier or manufacturer for assistance. Flash back may occur along vapour trail. Control of discharge should be attempted only by experienced persons. Do not attempt to extinguish fire until leak has been shut off. Notify environmental authorities.

Protective Clothing and Equipment

In fires or confined areas; Respiratory protection - self-contained breathing apparatus. Otherwise, Goggles - (mono), tight fitting, to protect against liquid (and frost burn). Gloves - rubber. Outerwear - as required.

Fire and Explosion

Stop or reduce discharge if safe to do so. Use water spray to cool fire-exposed containers. Stop flow of gas before attempting to extinguish fire.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin and eyes (liquid) remove contaminated clothing, irrigate eyes and flush skin with water; treat as for frostbite. Do not rub affected areas. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Recover undammaged containers.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Burn or flare at spill site (under knowledgeable supervision).

PROPYLENE GLYCOL $CH_3CH(OH)CH_2OH$

IDENTIFICATION

Common Synonyms

1,2 PROPYLENE GLYCOL
- METHYLENE GLYCOL
- MONOPROPYLENE GLYCOL
- α-PROPYLENE GYCOL
- METHYL GLYCOL
- TRIMETHYL GLYCOL

1,3 PROPYLENE GLYCOL
- 2-DIOXYGLYCOL
- TRIMETHYLENE GLYCOL
- β-PROPYLENE GLYCOL
- 1,3-HYDROXYPROPANE

Observable Characteristics

Colourless liquids.
Practically Odourless.

Manufacturers

Dow Chemical Canada Inc., Sarnia, Ontario.
Suppliers: Hall Chemical, Montreal, Quebec.
Originating from: Oxirane, USA

Transportation and Storage Information

Shipping State: Liquid
Classification: None.
Inert Atmosphere: No requirement.
Venting: Open (flame arrester).
Pump Type: Centrifugal or positive displacement; steel or stainless steel.

Label(s): Not regulated.
Storage Temperature: Ambient.
Hose Type: Seamless stainless steel.

Grades or Purity: Technical, 95+%; pure, 99%.
Containers and Materials: Drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): Soluble in all proportions.
Molecular Weight: 76.1
Vapour Pressure: (1,2) 0.2 mm Hg (20°C).
Boiling Point: (1,2) 188.2°C; (1,3) 210 to 211°C.

Floatability (Water): Sinks in freshwater; may float in saltwater.
Odour: Odourless (practically).
Flash Point: (1,2) 99°C (c.c.).
Vapour Density: (1,3) (1,2) 2.5
Specific Gravity: 1.04 (1,2); 1.05 (1,3) (20°C).

Colour: Colourless.
Explosive Limits: (1,2) 2.6 to 12.5%.
Melting Point: (1,2) -85°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: intoxication, nose and eye irritation, staggering, headache, mental confusion, nausea and vomiting, drowsiness, stupor. Ingestion: gastrointestinal irritation and symptoms similar to inhalation. Contact: skin - may be absorbed; eyes - redness, pain.

Toxicology: Low toxicity by all routes.
TLV®- No information.
Short-term Inhalation Limits - No information.

LC_{50} - No information.
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 20 g/kg (1,2)
LD_{50} - Oral: mouse = 4.77 g/kg (1,3)
TD_{Lo} - Oral: child = 70 g/kg (1,2)

Fire

Fire Extinguishing Agents: Use alcohol foam, dry chemical or CO_2. Water may be ineffective, but may be used to cool fire-exposed containers.
Behaviour in Fire: No information.
Ignition Temperature: (1,2) 371°C.
Burning Rate: 1.5 mm/min

Reactivity

With Water: No reaction; soluble.
Stability: Can react with oxidizing materials.
With Common Materials: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating >1 000 ppm/96 h/TLm/freshwater; BOD: 96%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

COMBUSTIBLE.

Immediate Responses

Keep non-involved people away from spill site. Call Fire Department. Call manufacturer for advice. Dike to prevent runoff. Notify environmental authorities.

Protective Clothing and Equipment

Outer protective clothing as required.

Fire and Explosion

Use alcohol foam. Water may be ineffective, but should be used to cool fire-exposed containers.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give plenty of water to conscious victim to drink and induce vomiting. If medical assistance is not immediately available, transport victim to doctor, hospital or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manfacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

PROPYLENE OXIDE CH_3CHCH_2O

IDENTIFICATION

UN No. 1280

Common Synonyms

METHYLOXIRANE
1,2-PROPYLENE OXIDE
1,2-EPOXYPROPANE
PROPENEOXIDE
METHYL ETHYLYLENE OXIDE

Observable Characteristics

Colourless liquids. Ethereal odour.

Manufacturers

Dow Chemical Canada Inc., Sarnia, Ontario.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable liquid.
Inert Atmosphere: Inerted.
Venting: Safety-relief.
Pump Type: Rotary or centrifugal; steel, stainless steel.

Label(s): Red and white label - FLAMMABLE LIQUID; Class 3.1, Group I.
Storage Temperature: Ambient.
Hose Type: Seamless stainless steel.

Grades or Purity: Technical.
Containers and Materials: Drums, tank cars; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 65 g/100 mL (30°C); 40.5 g/100 mL (20°C).
Molecular Weight: 58.1
Vapour Pressure: 400 mm Hg (18°C).
Boiling Point: 34°C.

Floatability (Water): Floats and mixes.
Odour: Ethereal (9.9 to 35.0 ppm, odour threshold)
Flash Point: -37°C (c.c.).
Vapour Density: 2.0
Specific Gravity: 0.83 (20°C).

Colour: Colourless.
Explosive Limits: 2.8 to 37.0%.
Melting Point: -104 to -112°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: headache, coughing, nausea, vomiting, unconsciousness, mild depression of central nervous system and lung irritation. Contact: skin - inflammation, burns; eyes - very irritating, watering, corneal burns, inflammation. Ingestion: abdominal pain, nausea and vomiting, diarrhea, convulsions.
Toxicology: Moderately toxic by all routes.
TLV®- 20 ppm, 50 mg/m^3.
Short-term Inhalation Limits - No information.
LC_{50} - Inhalation: mouse = 1 740 ppm/4h.
Delayed Toxicity - Suspected carcinogen.
LD_{50} - Oral: rat = 0.93 g/kg

Fire

Fire Extinguishing Agents: Use dry chemical, alcohol foam or carbon dioxide. Water may be ineffective but should be used to cool fire-exposed containers and disperse vapours. Do not extinguish fire until leak is shut off.
Behaviour in Fire: Flashback may occur along vapour trail. Contact with certain materials may cause polymerization which may result in container rupture.
Ignition Temperature: 449°C.
Burning Rate: 3.3 mm/min.

Reactivity

With Water: No reaction; soluble.
Stability: Can react vigorously with oxidizing materials. May polymerize violently with anhydrous chlorides of iron, tin, aluminum; peroxides of iron or aluminum and alkaline metal hydroxides. Reacts violently with ammonium hydroxide, chlorosulfonic acid, hydrochloric acid, hydrofluoric acid, nitric acid, oleum and sulfuric acid.
With Common Materials: Stable, within the limits of the foregoing.

Environment

Water: Prevent entry into potable water intakes and waterways. Harmful to aquatic life. Aquatic toxicity rating >1 000 ppm/96 h/TLm/freshwater; BOD: 75%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning, "FLAMMABLE". Call Fire Department. Eliminate all ignition sources. Dike to prevent runoff. Notify manufacturer. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Clothing and boots: rubber.

Fire and Explosion

Use dry chemical, alcohol foam or carbon dioxide to extinguish. Water may be ineffective, but should be used to cool fire-exposed containers and disperse vapours. Flashback may occur along vapour trail. Contact with certain materials may cause polymerization which may result in container rupture.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing, and flush affected areas with plenty of water; eyes - irrigate with plenty of water for at least 15 minutes. Ingestion: give plenty of water to conscious victim to drink. Induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Adsorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manfacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

SODIUM Na

IDENTIFICATION

UN No. 1428 sodium metal
1429 sodium metal dispersions in organic liquids

Common Synonyms	Observable Characteristics	Manufacturers
SODIUM METAL METALLIC SODIUM NATRIUM	Silvery-white. Solid, turning greyish-white upon exposure to air. Odourless.	Canadian suppliers: Ethyl Corporation of Canada Ltd., Corunna, Ont., Toronto, Ont.

Transportation and Storage Information

Shipping State: Solid.
Classification: Flammable solid (dangerous when wet).
Inert Atmosphere: Under naphthas or parrafins for shipping and storage.
Venting: Pressure-vacuum.

Label(s): Blue label - FLAMMABLE; Class 4.3, Group II.
Storage Temperature: Ambient.

Grades or Purity: Commercial, technical; 99.9%.
Containers and Materials: Drums and smaller containers (solid form); under naphthas or parrafins. May also be shipped as a dispersion in organic liquids.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (water): Reacts violently forming H_2 gas and NaOH.
Molecular Weight: 23
Vapour Pressure: 0.014 mm Hg (300°C); 1.6 mm Hg (400°C).
Boiling Point: 881 to 893°C.

Floatability (Water): Reacts violently with water, producing H_2 gas and NaOH.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: 0.97 (20°C); liquid, 0.93.

Colour: Silvery-white; greyish-white upon exposure to air.
Explosive Limits: Not flammable (Note melting point). Hydrogen: 4.1 to 74.2% (for hydrogen).
Melting Point: 97.8°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: (NaOH fumes) irritation of nose, eyes and throat, difficulty breathing, coughing. Ingestion: (improbable) immediate burning sensation, vomiting, stomach cramps, rapid breathing, diarrhea, loss of consciousness. Contact: skin - painful ulcerations irreparable tissue damage, shock; eyes - very painful, intense watering, burns and ulcerations.
Toxicology: Highly toxic upon contact.

TLV® - Inhalation: 2 mg/m³ (as NaOH).	LC_{50} - No information.	LD_{50} - No information.
Short-term Inhalation Limits - No information.	Delayed Toxicity - No information.	

Fire

Fire Extinguishing Agents: Soda Ash, dry sodium chloride or dry graphite may be used (written in order of preference). DO NOT USE WATER.
Behaviour in Fire: Burns violently accompanied by explosions which cause splattering of the material. Vapour ignites spontaneously at room temperature.
Ignition Temperature: >115°C (as hydrogen evolved from contact with water or moisture).
Burning Rate: No information.

Reactivity

With Water: VIOLENT - generates hydrogen and is very exothermic. Reaction with water also produces sodium hydroxide (NaOH).
With Common Materials: Reacts violently with aluminum bromide, aluminum chloride, aluminum fluoride, ammonium nitrate, antimony halides, arsenic halides, bismuth halides, carbon dioxide, carbon tetrachloride, chlorinated hydrocarbons, chlorine, chloroform, chromium halides and oxides, copper halides and oxides, 1,2-dichloroethylene, dichloromethane, hydrochloric acid, hydrofluoric acid, hydrogen peroxide, hydrogen sulfide, iodine, iron, iron halides, lead oxide, maleic anhydride, manganese halides, mercury halides, methyl chloride, monoammonium phosphate, nitric acid, nitrous oxide, phosgene, phosphorus, phosphorus halides and oxides, potassium oxides, silver halides, sulfur, sulfur halides and oxides, sulfuric acid, tin halides, tetrachloroethane, trichloroethylene, vanadium halides and zinc halides.
Stability: Reactive with moisture, air and many common compounds.

Environment

Water: Sodium with water produces NaOH which raises the pH of a water body; this can be harmful to aquatic life; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE, REACTS VIOLENTLY WITH WATER, LIBERATING HYDROGEN. VERY REACTIVE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE AND REACTIVE WITH WATER". CALL FIRE DEPARTMENT (warn them of the unusual properties - no water). Contact manufacturer for assistance. Contain spill area by diking with earth or other available material. Avoid contact and inhalation of fumes. Notify environmental authorities.

Protective Clothing and Equipment

In fires or confined spaces - Respiratory protection - self-contained breathing apparatus. Otherwise, Goggles - (mono), tight fitting. If face shield is used it must not replace goggles. Gloves - rubber. Boots - safety, rubber (pants worn outside boots). Outerwear - flame-proofed overalls or coveralls.

Fire and Explosion

Use soda ash, dry sodium chloride or dry graphite to extinguish. DO NOT USE WATER. Burns violently, accompanied by explosions which cause splattering of the material. Vapour ignites spontaneously at room temperature. Vapour droplets ignite spontaneously at 121°C. Pools of molten sodium ignite at 204 to 427°C.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Contact: eyes - irrigate with plenty of water; skin: remove particles of sodium quickly but carefully and flush affected area with a copious amount of water for at least 30 minutes. Remove contaminated clothing at once. Inhalation: in case of exposure to fumes from fire, give oxygen if breathing is difficult, give artificial respiration if breathing has stopped. Ingestion: (improbable) give water to conscious victim to rinse mouth. Do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material by manual or mechanical means. Avoid contact with water or moisture.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SODIUM ALUMINATE $Na_2Al_2O_3$ or $NaAlO_2$

IDENTIFICATION — UN No. 2812 anhydrous, 1819 solution

Common Synonyms	Observable Characteristics	Manufacturers
META-SODIUM ALUMINATE ALUMINUM SODIUM OXIDE	White powder. Odourless.	Handy Chemicals, Laprairie, Quebec.

Transportation and Storage Information

Shipping State: Solid or liquid (aqueous solution). **Classification:** Solution - Corrosive. **Inert Atmosphere:** No requirement. **Venting:** Open. **Pump Type:** No information.	**Label(s):** Solution - Black and white label - CORROSIVE. **Storage Temperature:** Ambient. **Hose Type:** No information.	**Grades or Purity:** Technical or 27°Bé solution. **Containers and Materials:** Solid - multi-wall paper sacks, drums. Solution - drums and bulk; steel or stainless steel.

Physical and Chemical Characteristics

Physical State Solid. **Solubility (Water):** Very soluble. **Molecular Weight:** 82 ($Na\ Al\ O_2$). **Vapour Pressure:** No information. **Boiling Point:** >1 800°C.	**Floatability (Water):** Sinks and mixes. **Odour:** Odourless. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** >1.5 (20°C); 27°Bé solution 1.23	**Colour:** White. **Explosive Limits:** Not flammable. **Melting Point:** 1650°C

HAZARD DATA

Human Health

Symptoms: Inhalation: (dust) irritation of respiratory tract. Ingestion: sore throat, abdominal pain, diarrhea. Contact: skin - redness and pain; eyes - watering, redness and pain.
Toxicology: Moderately toxic by all routes.

TLV® - No information. Short-term Inhalation Limits - No information.	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - No information.

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used in fires involving sodium aluminate.
Behaviour in Fire: Not combustible.

Ignition Temperature: Not combustible.	**Burning Rate:** Not combustible.

Reactivity

With Water: No reaction; soluble.
With Common Materials: No information.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

CORROSIVE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "CORROSIVE". Call manufacturer or supplier for advice. Dike to prevent runoff from rainwater or water application. Notify environmental authorities.

Protective Clothing and Equipment

Protective outer clothing as required.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used in fires involving sodium aluminate.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give conscious victim plenty of water to drink. If medical assistance is not immediately available, transport victim to doctor, hospital or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SODIUM ARSENITE $NaAs_5O_2$

IDENTIFICATION

UN No. 1686 Aqueous solutions
2027 Anhydrous

Common Synonyms	Observable Characteristics	Manufacturers
SODIUM META ARSENITE ARSENEOUS ACID MONOSODIUM SALT	White to grey-white powder. Odourless.	No Canadian Manufacturers.

Transportation and Storage Information

Shipping State: Solid, aqueous solutions.	**Label(s):** Black and white label - POISON; Group 6.	**Grades or Purity:** Pure; Technical (55 to 98%); Solution 75% arseneous oxide.
Classification: Poison.	**Storage Temperature:** Ambient.	
Inert Atmosphere: No requirement.	**Hose Type:** No information:	**Containers and Materials:**
Venting: Pressure-vacuum.		
Pump Type: No information.		

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.	**Floatability (Water):** Sinks and mixes.	**Colour:** White to greyish-white.
Solubility (Water): Soluble.	**Odour:** Odourless.	**Explosive Limits:** Not flammable.
Molecular Weight: 129.9	**Flash Point:** Not flammable.	**Melting Point:** 615°C.
Vapour Pressure: No information.	**Vapour Density:** No information.	
Boiling Point: Decomposes.	**Specific Gravity:** 1.87 (20°C).	

HAZARD DATA

Human Health

Symptoms: Inhalation and Ingestion: irritation of stomach and intestines, abdominal pain, nausea and vomiting, mental confusion, weakness, diarrhea, coma.
Contact: skin - irritation and burning; eyes - irritation and burning.
Toxicology: Highly toxic by ingestion and contact.

TLV® (as As) 0.2 mg/m^3	LC_{50} - No information.	LD_{50} - Oral: rat = 0.041 g/kg
Short-term Inhalation Limits - No information.	Delayed Toxicity - No information.	LD_{50} - Skin: rat = 0.15 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used. Water should be used sparingly to avoid contamination of area with material.
Behaviour in Fire: Not combustible.

Ignition Temperature: Not combustible.	**Burning Rate:** Not combustible.

Reactivity

With Water: No reaction; soluble.
With Common Materials: No information.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicities: 14 to 39 mg/L/96 h/rainbow trout/LC_{50}/freshwater; 21 to 42 mg/L/96 h/LC_{50}/freshwater.
Land-Air: Waterfowl = 32 mg/kg, LD_{50}.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Issue warning "POISON". Avoid contact and inhalation. Notify manufacturer or supplier. Dike to prevent runoff. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally-encapsulated suit.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used on fires involving sodium arsenite. Water should be used sparingly to avoid contamination of area with material.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give conscious victim plenty of water to drink and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop and reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Removel material by manual or mechanical means.
5. Recover undamaged containers.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SODIUM BOROHYDRIDE $NaBH_4$

IDENTIFICATION

UN No. 1426

Common Synonyms	Observable Characteristics	Manufacturers
BOROHYDRIDE SODIUM TETRAHYDROBORATE	White to grey-white powder or lumps. Odourless.	No Canadian Manufacturers. Mallinckrodt Ind. Chem., St. Louis, MO.

Transportation and Storage Information

Shipping State: Solid.
Classification: Flammable solid.
Inert Atmosphere: No requirement.
Venting: Closed.

Label(s): Blue and white label - FLAMMABLE SOLID; Class 4.3, Group I.
Storage Temperature: Ambient.

Grades or Purity: 95 to 98% minimum purity; dry powder pellets; 12% solution in 43% aqueous sodium hydroxide.
Containers and Materials: Bottles, polyethylene - lined metal drums.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): 55 g/100 mL (25°C); reacts with hot water producing H_2 and $Na_2B_4O_7 \cdot 10H_2O$.
Molecular Weight: 37.8
Vapour Pressure: No information.
Boiling Point: Decomposes (400°C).

Floatability (Water): Sinks and mixes or reacts.
Odour: Odourless.
Flash Point: Not flammable, but the hydrogen released from decomposition is.
Vapour Density: No information.
Specific Gravity: 1.07 (20°C).

Colour: White to grey-white.
Explosive Limits: Not flammable, but the hydrogen released from decomposition is.
Melting Point: Decomposes (400°C).

HAZARD DATA

Human Health

Symptoms: Inhalation: sore throat, shortness of breath, coughing, headache; Contact: eyes - redness, pain; skin-redness; Ingestion: sore throat, abdominal pain, diarrhea, headache, dizziness.
Toxicology: Highly toxic by ingestion.
TLV®- (as sodium borate anhydrous) 1 mg/m^3; as sodium borate decahydrate 5 mg/m^3.
Short-term Inhalation Limits - No information.

LC_{50} - No information.
Delayed Toxicity - No information.

LD_{50} - Intraperitoneal: rat = 0.018 g/kg

Fire

Fire Extinguishing Agents: Graphite, limestone, soda ash, sodium chloride powders. DO NOT USE water, carbon dioxide, or halogenated extinguishing agents.
Behaviour in Fire: Decomposes and produces highly flammable hydrogen gas.
Ignition Temperature: Not combustible by itself - hydrogen is ignited at 500°C.
Burning Rate: Not combustible.

Reactivity

With Water: Soluble; reacts with hot water to produce hydrogen gas and sodium borate.
With Common Materials: Can react with oxidizing materials.
Stability: Stable.

Environment

Water: prevent entry into water intakes and waterways. As sodium borate: Fish toxicity: 3 000 to 3 300 ppm/tns/minnow/minimum lethal dose/freshwater; 8 200 ppm/48 h/mosquito fish/TLm/freshwater.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE - flammable gas released (H_2) upon contact with water.

Immediate Responses

Keep non-involved people away from spill site. Issue warning "FLAMMABLE". CALL FIRE DEPARTMENT. Notify manufacturer or supplier. Dike to prevent runoff. Notify environmental authorities.

Protective Clothing and Equipment

In fires Respiratory protection - self-contained breathing apparatus. Otherwise, Goggles, Gloves rubber; boots - rubber (pants worn outside boots) and protective outer clothing as required.

Fire and Explosion

Use graphite, limestone, soda ash and sodium chloride powders to extinguish. Do not use water, carbon dioxide, or halogenated extinguishing agents. Decomposes and produces highly flammable hydrogen gas.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured give oxygen. Contact: skin - remove contaminated clothing, and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give plenty of water to conscious victim to drink and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or, clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop and reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SODIUM CARBONATE Na_2CO_3 (anhydrous)

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
CALCINED SODA SODA ASH SODA MONOHYDRATE CRYSTAL CARBONATE CARBONIC ACID, DISODIUM SALT	White to grey crystalline solid or powder. Odourless.	Allied Chemical Limited, Amherstburg, Ontario.

Transportation and Storage Information

Shipping State: Solid.
Classification: None.
Inert Atmosphere: No requirement.
Venting: Open.

Label(s): Not regulated.
Storage Temperature: Ambient.

Grades or Purity: Dense (58%), light (58%), extra light, natural and refined.
Containers and Materials: Bags, barrels, drums and bulk by truck or train; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): 7.1 g/100 mL (0°C); 22 g/100 mL (20°C); 45.5 g/100 mL (100°C).
Molecular Weight: 106.0
Vapour Pressure: No information.
Boiling Point: Slowly begins to decompose at 400°C.

Floatability (Water): Sinks and mixes.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: 2.53 (20°C).

Colour: White to grey .
Explosive Limits: Not flammable.
Melting Point: 851°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of respiratory tract, coughing, sneezing, difficulty breathing. Contact: with dust causes eye and skin irritation. Excessive contact can cause "soda ulcers" and perforation of nasal septum. Ingestion: of large amounts is corrosive to the gastrointestinal tract, causing cramps, vomiting, diarrhea and possible circulatory collapse.
Toxicology: Moderately toxic by ingestion. Low toxicity by inhalation and contact.

TLV®- No information.
Short-term Inhalation Limits - No information.

LC_{50} - No information.
Delayed Toxicity - No information.

LD_{50} - Intraperitoneal: mouse = 0.117 g/kg
LD_{Lo} - Oral: rat = 4 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used on fires involving sodium carbonate.
Behaviour in Fire: Not combustible. Begins to decompose at 400°C producing CO_2 gas.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: No reaction; moderately soluble.
With Common Materials: Can react violently with aluminum phosphorus pentoxide and fluoride sulfuric acid.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 265 mg/L/48 h/Daphnia magna/TLm/freshwater; BOD: No information.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from spill site. Avoid contact and inhalation of dust. Stop or reduce discharge, if this can be done without risk. Notify supplier. Notify environmental authorities.

Protective Clothing and Equipment

If dust is present wear dust respirator, industrial (tight fitting) goggles, gloves and coveralls.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used on fires involving sodium carbonate.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give warm water to conscious victim to drink. Do not induce vomiting. If medical attention is not immediately available, transport victim to hospital, clinic or doctor.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss cleanup and disposal of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Contaminated materials may be buried in a secured landfill site (approval of environmental authorities required).

SODIUM CHLORATE $NaClO_3$

IDENTIFICATION

UN No. 1495 solid
2428 solution

Common Synonyms	Observable Characteristics	Manufacturers
CHLORATE OF SODA CHLORIC SALT OF SODIUM	Colourless to white crystalline solid, colourless in solution. Commercial material may be pale yellow.	Erco Industries Ltd., Buckingham, Que., Vancouver, B.C., Thunder Bay, Ontario. PPG Industries (CPI), Beauharnois, Que. Canadian Occidental Petroleum, Squamish, B.C., Nanaimo, B.C. B.C. Chemicals, Prince George, B.C.

Transportation and Storage Information

Shipping State: Solid, liquid (aqueous solution).
Classification: Oxidizer.
Inert Atmosphere: No requirement.
Venting: Open.
Pump Type: For solutions, most types.

Label(s): Yellow label - OXIDIZER; Class 5.1, Group II.
Storage Temperature: Ambient.
Hose Type: Polyethylene, polypropylene, natural rubber.

Grades or Purity: Commercial, 99% $NaClO_3$; technical, 99.5% minimum.
Containers and Materials: Anhydrous: drums; steel, plastic-lined steel. Solutions: drums, tank cars; stainless steel, plastic-lined steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid or liquid (solution)
Solubility (Water): 72 g/100 mL (-15°C); 79 g/100 mL (0°C); 101 g/100 mL (20°C); 126 g/100 mL (40°C).
Molecular Weight: 106.4
Vapour Pressure: Not pertinent.
Boiling Point: Decomposes at 300°C releasing oxygen.

Floatability (Water): Mixes and sinks.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: Solid: 2.49 (15°C); Saturated Solution: 1.43 (20°C); 1.38 (-15°C).

Colour: Colourless to white (or pale yellow).
Explosive Limits Not flammable.
Melting Point: 248 to 261°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: sneezing, small nasal ulcerations, irritation of respiratory tract. Contact: Prolonged exposure to dust may result in irritation to the skin, mucous membranes and eyes. Ingestion: vomiting, abdominal pain, cyanosis, diarrhea, unconsciousness and death.
Toxicology: Moderately toxic by ingestion. Low toxicity by inhalation and contact.
TLV®- No information.
Short-term Inhalation Limits - No information.
LC_{50} - No information.
Delayed Toxicity - No information.
LD_{50} - Oral: rat = 1.2 g/kg

Fire

Fire Extinguishing Agents: Not combustible by itself but causes combustion. In fires involving sodium chlorate, use water in flooding amounts.
Behaviour in Fire: Upon decomposition, releases toxic chloride fumes. Upon heating, can release oxygen, making extinguishment difficult.
Ignition Temperature: Not combustible, but causes combustion of other materials.

Reactivity

With Water: No reaction; soluble.
With Common Materials: In contact with strong acids, can release toxic chlorine and chlorine dioxide gases. Reacts with aluminum, ammonium thiosulfate, arsenic, arsenic trioxide, carbon, charcoal, copper, manganese dioxide, metal sulfides, organic acids, organic matter, phosphorus, potassium cyanide, sulfur, sulfuric acid, thiocyanates and zinc.
Stability: Stable within the limits of the foregoing.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. Aquatic toxicity rating = >1 000 ppm/96 h/TLm/freshwater; Fish toxicities: 3.8 ppm/*Scenedesmus*/threshold toxicity/freshwater; 4 200 ppm/24 h/rainbow trout/LC_{50}/freshwater; 3 157 ppm/24 h/channel catfish/LC_{50}/freshwater.
Land-Air: Detrimental to vegetation - is used as a weed killer.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

OXIDIZER.

Immediate Responses

Keep non-involved people away from spill site. Issue warning "OXIDIZER". Call Fire Department. Notify manufacturer. Avoid contact and inhalation. Contain spill by diking to prevent runoff. Stop or reduce discharge, if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

In fires - Respiratory protection - self-contained breathing apparatus. Otherwise, if dust is present, respirator should be used. Goggles - (mono), tight fitting, or face shield. Gloves - rubber. Outer clothing - nonflammable coveralls, etc. Do not use organic material such as leather, etc. Boots - rubber; avoid contact of contaminated clothing with ignition sources.

Fire and Explosion

Not combustible by itself, but can cause most organic material to ignite. Use water in flooding amounts. Clothing impregnated with sodium chlorate is highly flammable when dry.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: eyes - irrigate immediately with plenty of water; skin - remove contaminated clothing and flush affected areas with plenty of water. Ingestion: give milk or water to conscious victim to drink and induce vomiting. Repeat several times. Keep warm and quiet. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means (for solid spills).
5. Remove undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SODIUM CHLORIDE NaCl

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
COMMON SALT HALITE ROCK SALT SEA SALT	Colourless to white powder, lumps. Odourless.	Domtar, Goderich, Ontario. Canadian Salt, Ojibway, Ontario. Dow Chemical Canada Fort Saskatchewan, Alberta.

Transportation and Storage Information

Shipping State: Solid. **Classification:** None. **Inert Atmosphere:** No requirement. **Venting:** Open.	**Label(s):** Not regulated. **Storage Temperature:** Ambient.	**Grades or Purity:** Variable. **Containers and Materials:** Multiwall paper bags, barrels, drums, bulk by train or truck; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid. **Solubility (Water):** 35.8 g/100 mL (20°C) 39.4 g/100 mL (100°C). **Molecular Weight:** 58.4 **Vapour Pressure:** 1 mm Hg (865°C). **Boiling Point:** 1413°C.	**Floatability (Water):** Sink and mixes. **Odour:** Odourless. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** 2.17 (25°C).	**Colour:** Colourless to white. **Explosive Limits:** Not flammable. **Melting Point:** 801°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: slight irritation of nose, sneezing; Ingestion: disagreeable taste, nausea and vomiting; Contact: skin - irritation and inflammation; eyes - irritation, watering, inflammation.
Toxicology: Low toxicity by all routes.

TLV® - No information. Short-term Inhalation Limits - No information.	LD_{50} - No information. Delayed Toxicity - No information.	LD_{50} - Oral: rat = 3.0 g/kg TL_{LO} - Oral: human = 12.36 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used in fires involving sodium chloride.
Behaviour in Fire: Not combustible.

Ignition Temperature: Not combustible.	**Burning Rate:** Not combustible.

Reactivity

With Water: No reaction; soluble.
With Common Materials: Can react violently with bromine trifluoride and lithium.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 17.5 g/L/96 h/mosquito fish/TLm/freshwater; 2.9 to 11.7/192 to 216 h/stickle-backs/LC_{50}/freshwater; 3.7 g/L/64 h/Daphnia magna/LC_{50}/freshwater. BOD: None.
Land-Air: Salt concentrations of 1.3 to 2.6 g/L may affect sensitive crops. Concentrations of 2.6 to 5.0 g/L restricts yields of many crops. Greater than 5.1 g/L affects most crops.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from spill site. Notify manufacturer or supplier. Dike to prevent runoff from rainwater or water application. Notify environmental authorities.

Protective Clothing and Equipment

Outer protective clothing as required.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used on fires involving sodium chloride.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: move victim to fresh air. Contact: skin - flush affected areas with water; eyes - irrigate with water. Ingestion: give conscious victim plenty of water to drink and induce vomiting. Transport victim to hospital, doctor, or clinic if necessary.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss cleanup and disposal of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Contaminated materials may be buried in a secured landfill site (approval of environmental authorities required).

SODIUM CYANIDE NaCN

IDENTIFICATION

UN No. 1689

Common Synonyms and Trade Names	Observable Characteristics	Manufacturers	
CYANIDE OF SODIUM CYANOGRAN (Du Pont) CYANOIDS (Kraft)	White, crystalline solid, powder or granules. Odourless when dry; when wet gives typical cyanide almond-like odour.	Canadian supplier: Canadian Industries Ltd., Montreal, Quebec.	Originating from: ICI, United Kingdom.

Transportation and Storage Information

Shipping State: Solid.
Classification: Poison.
Inert Atmosphere: No requirement.
Venting: Closed.

Label(s): White label - POISON; Class 6.1, Group I.
Storage Temperature: Ambient.

Grades or Purity: 97 to 99%.
Containers and Materials: Drums; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): 48 g/100 mL (10°C); 82 g/100 mL (35°C).
Molecular Weight: 49.0
Vapour Pressure: 1 mm Hg (817°C).
Boiling Point: 1496°C.

Floatability: (Water): Sinks and mixes.
Odour: Odourless when dry; when wet, gives typical cyanide almond-like odour.
Flash Point: Not flammable.
Vapour Density: 0.93 as HCN (25°C).
Specific Gravity: 1.6 (25°C).

Colour: White.
Explosive Limits: Not flammable.
Melting Point: 560 to 564°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: headache, dizziness, nausea, rapid breathing, anguish, convulsions, foaming at mouth, prolonged coma, death. Ingestion: symptoms similar to inhalation. Contact: skin - absorbed with symptoms similar to inhalation; eyes - irritation, watering and symptoms similar to inhalation.
Toxicology: Highly toxic by all routes.
TLV®- (skin) 5 mg/m^3 (as CN).
Short-term Inhalation Limits - No information.

LC_{50} - Inhalation: rat = 484 ppm/1 h (as HCN).
LC_{Lo} - Inhalation: human = 120 mg/m^3/1 h (as HCN); = 200 mg/m^3/10 min (as HCN).
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 0.0064 g/kg
LD_{Lo} - Oral: human = 0.0029 g/kg

Fire

Fire Extinguishing Agents: Not combustible; however, water may be used on fires involving sodium cyanide.
Behaviour in Fire: Not combustible. In fires may evolve toxic fumes.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: Contact with water or moist air may produce HCN; soluble.
With Common Materials: Contact with acids or weak alkalis produces poisonous and flammable HCN gas. Reacts violently with nitrates, nitrites and other oxidizing agents, and chlorates.
Stability: Stable when dry.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 0.15 ppm/96 h/bluegill/TLm/freshwater; 0.25 ppm/48 h/prawn/LC_{50}/saltwater; **BOD:** 6%, 7 days (theoretical).
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

POISON. Contact with acids or weak alkalis liberates HCN.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "POISON". Avoid contact and inhalation. Contact supplier or manufacturer for guidance. Stop or reduce discharge, if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Gloves - rubber.

Fire and Explosion

Not combustible. In fires involving sodium cyanide water may be used to extinguish; however, area should be diked to prevent runoff.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing, and flush affected areas with plenty of water; eyes -irrigate with plenty of water. Ingestion: induce vomiting in conscious victim, and repeat until vomitus is clear. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. If possible, dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means. Avoid contact with material.
5. Recover undamaged containers.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SODIUM DICHLOROISOCYANURATE NaNC(O)NClC(O)NClCO

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
NaDCC POOL CHLORINATOR 1-SODIUM-3,5-DICHLORO-S-TRIAZINE-2,4,6-TRIONE ISOCYANURIC ACID, DICHLORO SODIUM SALT SODIUM DICHLOROISOCYANURATE (dihydrate).	White powder. Bleach-like odour.	No Canadian Manufacturers. Monsanto, St. Louis, MO. FMC, Philadelphia, PA.

Transportation and Storage Information

Shipping State: Solid.
Classification: None.
Inert Atmosphere: No requirement.
Venting: Pressure-vacuum.

Label(s): Not regulated.
Storage Temperature: Cool, ambient.

Grades or Purity: Technical, 39 to 60% available chlorine.
Containers and Materials: Plastic-lined fibre drums, drums; steel, stainless steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): Soluble in all proportions, reacts to release chlorine.
Molecular Weight: 220.0 (anhydrous).
Vapour Pressure: No information.
Boiling Point: Decomposes 230°C.

Floatability (Water): Floats, mixes and reacts.
Odour: Bleach-like.
Flash Point: Not flammable.
Vapour Density: (as Cl_2) 2.5 (0°C).
Specific Gravity: 0.96 (20°C).

Colour: White.
Explosive Limits: Not flammable.
Melting Point: Decomposes 230°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: (dust) irritation of respiratory tract and mucous membranes; inhalation (of chlorine)-burning, irritation, difficulty breathing. Ingestion: irritation of gastrointestinal tract, difficulty breathing.
Toxicology: Moderately toxic by all routes.
TLV® (as chlorine) 1 ppm; 3 mg/m^3.
Short-term Inhalation Limits - (as chlorine) 3 ppm; 9 mg/m^3 (15 min).

LC_{50} - No information.
Delayed Toxicity - Symptoms may appear some time after exposure.

LD_{50} - Oral: rat = 1.40 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Use carbon dioxide or dry chemical to extinguish fires involving sodium dichloroisocyanurate. Water should only be used in flooding amounts.
Behaviour in Fire: When heated to decomposition, emits carbon monoxide and chloride fumes. Contact with water produces chlorine gas. Contact with organic material may cause spontaneous combustion.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: Reacts to release chlorine gas.
With Common Materials: Reacts with many organic materials, to initiate spontaneous combustion. Can react violently with ammonia, ammonium salts, urea and hydrated salts.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity = 0.07 to 0.15 ppm/96 h/fathead minnow/LC_{50}/freshwater (as Cl); 0.14 to 0.29 ppm/96 h/rainbow trout/TL_{50}/freshwater.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

OXIDIZER. CORROSIVE. Reacts with water to release chlorine.

Immediate Responses

Keep non-involved people away from spill site. Call Fire Department. Avoid contact and inhalation. Notify manufacturer or supplier. Notify environmental authorities.

Protective Clothing and Equipment

In fires or confined spaces Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Otherwise, outer protective clothing as required and self-contained breathing apparatus.

Fire and Explosion

Not combustible. Use dry chemical or carbon dioxide to extinguish fires involving sodium dichloroisocyanurate. Water should only be used in flooding amounts. When heated to decomposition emits carbon monoxide and chloride fumes.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with water; eyes - irrigate with water. Ingestion: give conscious victim water to drink and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain spill by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SODIUM DICHROMATE $Na_2Cr_2O_7 \cdot 2H_2O$

IDENTIFICATION

UN No. 1479

Common Synonyms	Observable Characteristics	Manufacturers	
SODIUM ACID CHROMATE SODIUM BICHROMATE SODIUM BICHROMATE DIHYDRATE	Red-orange crystalline solid. Odourless.	No Canadian manufacturers. Selected U.S. manufacturer: Essex Chemical Company, Clifton, NJ, USA	Canadian supplier: Canadian Industries Limited, Toronto, Ontario. Allied Chemical Ltd., Toronto, Ont., Montreal, Quebec.

Transportation and Storage Information

Shipping State: Solid, liquid (aqueous solution).
Classification: Oxidizer.
Inert Atmosphere: No requirement.
Venting: Open.
Pump Type: Gear, centrifugal; steel, stainless steel (for solutions only).

Label(s): Yellow label - OXIDIZER; Class 5.1, Group II.
Storage Temperature: Ambient.
Hose Type: Natural rubber, polyethylene, polypropylene.

Grades or Purity: Technical, crystalline (98.8-99%). Technical, solution (69-70%).
Containers and Materials: Dry - multiwall paper bags; fibre drums. Solution - tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): 238 g/100 mL (0°C); 508 g/100 mL (80°C).
Molecular Weight: 298.1
Vapour Pressure: No information.
Boiling Point: Decomposes (400°C).

Floatability (Water): Sinks and mixes.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: 2.52 (13°C); 2.34 (25°C).

Colour: Red-orange.
Explosive Limits: Not flammable.
Melting Point: 357°C (anhydrous). 69 to 70% solution, -48.2°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation of nose and eyes, tingling and burning sensation in respiratory tract, sneezing. Contact: extremely corrosive to skin and mucous membranes. May cause rash or external ulcers on skin. Ingestion: of large quantities may be fatal, burning sensation in mouth and throat, nausea and vomiting.
Toxicology: Highly toxic by contact and ingestion.

TLV®- (inhalation) 0.05 mg/m^3 (as Cr).
Short-term Inhalation Limits - No information.

LC_{50} - No information.
Delayed Toxicity - Suspected carcinogen.

LD_{50} - Intraperitoneal: rodent = 0.16 g/kg
LD_{Lo} - Intraperitoneal: guinea pig = 0.335 g/kg

Fire

Fire Extinguishing Agents: Not combustible. In fires involving sodium dichromate, flood with water.
Behaviour in Fire: Not combustible but may ignite combustible materials upon contact. Decomposes to produce oxygen when heated.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: No reaction; soluble. Sodium dichromate is a strong oxidizer and may ignite organic materials.
With Commmon Materials: Reacts violently with hydrazine.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. Fish toxicity: 145 ppm/24 h/bluegill/TLm/freshwater; 10 ppm/48 h/Daphnia magna/TLm/freshwater; Aquatic Toxicity rating = 100 to 1 000 ppm/96 h/TLm; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

OXIDIZER.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "OXIDIZER". Avoid contact and inhalation. Stop or reduce discharge if this can be done without risk. Dike to prevent runoff. Notify manufacturer or supplier and environmental authorities.

Protective Clothing and Equipment

Goggles - (mono), tight fitting. Gloves - rubber. Dust respirator. Protective work clothing - rubber apron, coveralls. Boots - high, rubber (pants outside boots).

Fire and Explosion

Not combustible. In fires involving this material, flood discharge area with water.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured give oxygen. Contact: eyes - irrigate with plenty of water; skin - flush affected areas with plenty of water and remove contaminated clothing. Ingestion: do not induce vomiting; however, vomiting may occur spontaneously. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SODIUM DITHIONITE $Na_2S_2O_4 \cdot xH_2O$ (x = 0 to 2)

IDENTIFICATION

UN No. 1384

Common Synonyms	Observable Characteristics	Manufacturers	
SODIUM BISULFITE SODIUM HYDROSULFITE SODIUM SULFOXYLATE	White to yellow powder or crystals. Sulfurous odour.	No Canadian manufacturer. Canadian supplier: Vir Chem of Canada, Montreal, Que.	Originating from: Virginia Chem, USA Royce Chemical, USA (direct)

Transportation and Storage Information

Shipping State: Solid.
Classification: Flammable solid; spontaneous combustible.
Inert Atmosphere: No requirement.
Venting: Closed.

Label(s): Red and white label - FLAMMABLE; Class 4.2, Group II. Red, black and white label - SPONTANEOUS COMBUSTIBLE.
Storage Temperature: Ambient.

Grades or Purity: Technical.
Containers and Materials: Barrels, kegs, boxes; glass or metal lined. Drums; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): 25 g/100 mL (20°C).
Molecular Weight: 174.1 (solute).
Vapour Pressure: No information.
Boiling Point: Decomposes, 52 to 55°C.

Floatability (Water): Sinks and mixes.
Odour: Faint sulfurous odour.
Flash Point: Not flammable by itself.
Vapour Density: No information.
Specific Gravity: 1.2 (20°C).

Colour: White to yellow.
Explosive Limits: Not flammable but can react with water.
Melting Point: Decomposes, 52 to 55°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: sore throat, coughing, shortness of breath. Contact: eyes and skin - redness and pain. Ingestion: causes abdominal pain and nausea.
Toxicology: Moderately toxic by skin contact, ingestion and inhalation.
TLV® - No information. LC_{50} - No information. LD_{50} - No information.
Short-term Inhalation Limits - No information. Delayed Toxicity - No information.

Fire

Fire Extinguishing Agents: Use dry sand, carbon dioxide, or dry chemical; water should only be used in flooding amounts. The addition of small amounts of water or contact with a highly humid atmosphere can cause fire.
Behaviour in Fire: In fires, sulfur dioxide is released.
Ignition Temperature: Decomposes, 52 to 55°C. **Burning Rate:** No information.

Reactivity

With Water: Small amounts of water or contact with a highly humid atmosphere can cause ignition. In large amounts of water; soluble.
With Common Materials: Reacts with acids to form sulfur oxides.
Stability: Stable, within the limits of the foregoing.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. BOD: No information.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE (spontaneously combustible).

Immediate Responses

Keep non-involved people away from spill area. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Warn about water and moisture hazard. Contact manufacturer or supplier for guidance. Contain spill area by diking with earth or other available material. Dike to contain runoff. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - in fire, use self-contained breathing apparatus. Goggles - (mono), tight fitting. Gloves - rubber. Boots - high, rubber (pants worn outside boots). Protective clothing - as required - coveralls, acid suit, etc.

Fire and Explosion

Extinguishing agents: dry sand, dry chemical, carbon dioxide. Use water only in flooding amounts. In fires, SO_2 is released.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Contact: eyes - irrigate with plenty of water; skin - flush with plenty of water. Ingestion: give large amounts of water or milk to conscious victim. Keep warm and quiet. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SODIUM HYDROSULFIDE $NaHS \cdot xH_2O$ (solution) (x = 0 to 3)

IDENTIFICATION

UN No. 2923 solid >25% water of crystallization
2318 solid <25% water of crystallization
NA2922 solution

Common Synonyms	Observable Characteristics	Manufacturers
SODIUM SULPHYDRATE SODIUM BISULFIDE SODIUM HYDROGEN SULFIDE SODIUM MERCAPTAN	Colourless to yellow crystals. Clear to light straw-coloured (yellow to black at higher temperatures). Offensive, rotten-eggs odour (H_2S).	Cornwall Chemical Ltd., Montreal, Quebec. Canadian Industries Ltd., (CIL), Montreal, Quebec.

Transportation and Storage Information

Shipping State: Solid or liquid (aqueous solution).
Classification: Spontaneous combustible; corrosive.
Inert Atmosphere: No requirement.
Venting: Pressure-vacuum.
Pump Type: Gear, centrifugal; steel, stainless steel (solutions only).

Label(s): Black and white label - CORROSIVE (>25% water of crystallization). Red, black and white label - SPONTANEOUS COMBUSTIBLE (<25% water of crystallization).
Storage Temperature: Ambient.
Hose Type: Natural rubber, Hypalon, polyethylene, polypropylene.

Grades or Purity: Anhydrous 70 to 72% NaHS. Solutions 40 to 44% NaHS.
Containers and Materials: Drums, tank cars, tank trucks; steel, stainless steel (aluminum, zinc, copper, brass, bronze are not resistant).

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid (typically shipped as solution).
Solubility (Water): Soluble in all proportions.
Molecular Weight: 56.1 (solute).
Vapour Pressure: No information.
Boiling Point: 100 to 122°C (solution).

Floatability (Water): Sinks and mixes.
Odour: Rotten-egg odour (0.047 ppm).
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: 1.31 (15.5°C).

Colour: Clear, light straw colour (yellow to black at higher temperatures).
Explosive Limits: Not flammable (4.3 to 46% (H_2S)).
Melting Point: 17°C; (solution) loses water; 55°C (anhydrous).

HAZARD DATA

Human Health

Symptoms: Corrosive alkaline liquid. Contact: eyes and skin - causes severe burns. Ingestion: causes severe burning and corrosion of the gastrointestinal tract, pain in throat and abdomen, nausea and vomiting, diarrhea. In severe cases, collapse, unconsciousness and paralysis of respiration may occur. Inhalation: of NaHS mist will cause irritation of the respiratory tract and possibly systemic poisoning. Vapours are extremely dangerous as the sense of smell is rapidly lost on exposure to high concentrations or prolonged exposure to dilute concentrations of H_2S in air.
Toxicology: Highly toxic by all routes.
TLV® (inhalation) 10 ppm; 14 mg/m^3 (as H_2S).
Short-term Inhalation Limits - 15 ppm; 21 mg/m^3 for 15 min (as H_2S).

LC_{50} - Inhalation: mouse = 673 ppm/1 h (H_2S).
Delayed Toxicity - No information.

LD_{50} - No information.

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used. Water should be used in flooding amounts. However, flammable and toxic H_2S is liberated when heated.
Behaviour in Fire: Not combustible, but releases flammable H_2S when heated.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: No reaction; soluble.
With Common Materials: NaHS is stable while alkaline. Reacts with acids to release hydrogen sulfide gas. Reacts violently with diazonium salts.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 206 mg/L/96 h/mosquito fish/TLm/freshwater.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

CORROSIVE. Upon heating releases H_2S (poisonous and flammable). <25% water of crystallization, spontaneously combustible.

Immediate Responses

Keep non-involved people away from spill site. Issue warnings: "CORROSIVE, SPONTANEOUSLY COMBUSTIBLE". Call Fire Department. Avoid contact or inhalation. Contact manufacturer for advice. If H_2S fumes are present, evacuate people downwind. Contain spill by diking with earth or other available material. Attempt to control discharge, if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - if H_2S present, use self-contained breathing apparatus. Goggles - (mono), tight fitting. If face shield used, it must not replace goggles. Gloves - rubber. Boots - high, rubber (pants worn outside boots). Outerwear - as required, acid suit, aprons, etc., rubber or vinyl.

Fire and Explosion

Not combustible by itself. H_2S is released upon heating; when containing <25% water of crystallization contact with water or moisture may cause spontaneous combustion. Most fire extinguishing agents may be used. Water should be used in flooding amounts.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Ingestion: if victim is conscious give large amounts of milk or water. Induce vomiting. Contact: eyes - immediately irrigate with plenty of water; skin - immediately flush affected areas with water and remove contaminated clothing. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. If liquid, remove material with pumps or vacuum equipment and place in appropriate containers.
4a. If solid, remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice or disposal.

SODIUM HYDROXIDE NaOH

IDENTIFICATION

UN No. 1823 solid
1824 solution

Common Synonyms	Observable Characteristics	Manufacturers	
CAUSTIC SODA CAUSTIC LYE SODA LYE SODIUM HYDRATE WHITE CAUSTIC	Clear to slightly turbid liquid, with a clear to slightly coloured (white to yellow) appearance. Odourless. Anhydrous solid: White to slightly coloured pellets or flakes.	Canadian Industries Limited, Becancour, Que. Dow Chemical Canada Inc., Sarnia, Ont., Fort Saskatchewan, Alta.	Canadian Occidental Petroleum Ltd., Vancouver, B.C. FMC, Squamish, B.C.

Transportation and Storage Information

Shipping State: Solid and liquid (aqueous solution).
Classification: Corrosive.
Inert Atmosphere: No requirement.
Venting: Open.
Pump Type: Gear, centrifugal; steel, stainless steel (for solutions).

Label(s): White and black label - CORROSIVE; Class 8, Group II.
Storage Temperature: Ambient.
Hose Type: Natural rubber, Hypalon, polyethylene, polypropylene, flexible stainless steel (solutions).

Grades or Purity: Solution, 50%, 73% NaOH. Dry - (anhydrous, 99+% NaOH), flake, powder solid.
Containers and Materials: Liquid - tank cars, tank trucks. Dry - cans, drums, hopper cars.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): Soluble, 42 g/100 mL (0°C); 111 g/100 mL (25°C); 347 g/100 mL (100°C).
Molecular Weight: 40.0 (solute).
Vapour Pressure: 1 mm Hg (739°C); 42 mm Hg (1000°C).
Boiling Point: 50% solution: 142 to 148°C; 73% solution: 188 to 195°C; 1 390°C (anhydrous).

Floatability (Water): Sinks and mixes.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: 213 (anhydrous); 50% soln, 1.53; 73% soln, 2.00 (15.5°C).

Colour: Liquid - clear to slightly coloured. Solid (dry) - white.
Explosive Limits: Not flammable.
Melting Point: Anhydrous 318°C; 50% solution, 12 to 15°C; 73% solution, 63°C.

HAZARD DATA

Human Health

Symptoms: Contact: skin - severe burns, often resulting in deep ulceration and ultimate scarring, can result from contact with solid or liquid forms. Eyes - solid or liquid; very rapidly causes severe damage. Inhalation: of dust or mist may cause damage to upper respiratory tract and even to lung tissue proper. Ingestion: (liquid or solid) severe damage to mucous membranes or deeper tissues. If perforation occurs, subsequent severe scar formation may occur. Penetration into vital areas may be fatal.
Toxicology: Highly toxic upon contact and ingestion.
TLV®- (inhalation) 2 mg/m^3 (particulate). LC_{50} - No information. LD_{LO} - Oral: rabbit = 0.5 g/kg (10% solution).
Short-term Inhalation Limits - No information. Delayed Toxicity - None known.

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used in fires involving sodium hydroxide. Use water in flooding amounts. Anhydrous form in contact with water may generate sufficient heat to ignite combustible materials. May cause ignition on contact with organic chemicals.
Behaviour in Fire: Not combustible.
Ignition Temperature: Not combustible. **Burning Rate:** Not combustible.

Reactivity

With Water: Anhydrous form dissolves with great heat evolution. Boils and splatters.
With Common Materials: Reacts violently with acetaldehyde, acetic acid, acetic anhydride, acrolein, acrylonitrile, allyl alcohol, allyl chloride, aluminum, chlorohydrin, chloronitrotoluenes, chlorosulfonic acid, 1;2-dichloroethylene, ethylene cyanohydrin, glyoxyl, hydrochloric acid, hydrofluoric acid, hydroquinone, maleic anhydride, nitric acid, nitroparaffins, oleum, phosphorus, phosphorus pentoxide, sulfuric acid, tetrahydrofuran and trichloroethylene.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life in high concentrations. Fish toxicity: 25 ppm/24 h/brook trout/LC_{100}/freshwater; 99 ppm/48 h/bluegill/TLm/freshwater; 10 to 33 ppm/48 h/shrimp/LC_{50}/saltwater; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "CORROSIVE". Call Fire Department. Contain spill by diking with earth or other available material. Contact manufacturer for advice. Avoid contact and inhalation. Stop or reduce discharge, if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - suitable respirator. Goggles - (mono), tight fitting. If face shield used, it must not replace goggles. Gloves - rubber. Boots - high, rubber (pants should be worn outside boots). Outerwear - as required; coveralls, aprons, suits - rubber, vinyl.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used in fires involving sodium hydroxide. Use water in flooding amounts. Anhydrous form in contact with water may generate sufficient heat to ignite combustible materials. May cause ignition on contact with organic materials.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: eyes - irrigate with plenty of water; skin -flush with plenty of water, while removing contaminated clothing. Continue washing (eyes and skin) for an additional 30 minutes if considered necessary. Ingestion: give large quantities of milk or water to conscious victim only, to dilute chemical. Vomiting may occur spontaneously but should not be induced. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SODIUM HYPOCHLORITE NaOCl

IDENTIFICATION

UN No. 1791

Common Synonyms/Trade Names	Observable Characteristics	Manufacturers
CHLOROX LIQUID BLEACH	Green to yellow watery liquid. Chlorine-type odour (like bleach). Pure sodium hypochlorite is a powder which is unstable in air, and rarely shipped.	Bristol-Myers Canada, Toronto, Ont. Canadian Industries Ltd., Becancour, Que. MacMillan Bloedel, Nanaimo, B.C. Prince Albert Pulp, Prince Albert, Sask.

Transportation and Storage Information

Shipping State: Liquid (aqueous solution).
Classification: Corrosive liquid.
Inert Atmosphere: No requirement.
Venting: Pressure-vacuum.
Pump Type: Steel, stainless steel.

Label(s): Black and white label - CORROSIVE LIQUID; Class 8, Group II.
Storage Temperature: Ambient.
Hose Type: Natural rubber, Hypalon, polyethylene, polypropylene, flexible stainless steel.

Grades or Purity: Technical >7% available chlorine; solutions are typically 7 to 15% chlorine.
Containers and Materials: Carboys, drums and tanks cars.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): Solutions are soluble in all proportions (26.0 g/100 mL (0°C) (anhydrous).
Molecular Weight: 74.4 (solute).
Vapour Pressure: No information.
Boiling Point: Decomposes at temperatures >100°C.

Floatability (Water): Sinks and mixes.
Odour: Like chlorine bleach.
Flash Point: Not flammable (solutions).
Vapour Density: No information.
Specific Gravity: 1.00 to 1.025 at 20°C (solution; depending on concentration).

Colour: Green to yellow.
Explosive Limits: Anhydrous explosive in air; solutions not flammable.
Melting Point: 5% solution, -6°C.

HAZARD DATA

Human Health

Symptoms: Contact: eyes and skin - irritation, burning and inflammation. Inhalation: of fumes causes severe pulmonary irritation with coughing and choking followed by pulmonary edema. Ingestion: irritation and corrosion of mucous membranes with pain and vomiting, stomach cramps, and diarrhea.
Toxicology: Moderately toxic by inhalation and ingestion.
TLV - 1 ppm; 3 mg/mL (as chlorine).
Short-term Inhalation Limits - 3 ppm; 9 mg/mL (15 min) (as chlorine).
LC_{50} - No information.
Delayed Toxicity - None known.
LD_{50} - No information.

Fire

Fire Extinguishing Agents: Solutions are not combustible; however, in fires involving sodium hypochlorite solution, most fire extinguishing materials may be used. In fires involving anhydrous form, water should only be used in flooding amounts.
Behaviour in Fire: Decomposes in fire, generating toxic and corrosive chlorine gas. $NaOCl \cdot 5H_2O$ highly unstable, anhydrous form explosive in air.
Ignition Temperature: Solutions not combustible. **Burning Rate:** Solutions not combustible.

Reactivity

With Water: No reaction. Soluble. Anhydrous form reacts violently with water.
With Common Materials: Concentrated forms may cause combustible materials to ignite. Reacts violently with amines, ammonium acetate, ammonium carbonate, ammonium nitrate, ammonium phosphate, cellulose and ethyleneimine.
Stability: Solutions are stable. (Anhydrous and pentahydrate are not stable.)

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. Fish toxicity: 5.9 ppm/96 h/fathead minnow/LC_{50}/freshwater (4 to 6% aqueous solution); 52 ppm/96 h/grass shrimps/LC_{50}/freshwater (4 to 6% aqueous solution); BOD: No information.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE. Concentrated and other forms can be strong oxidizers.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "CORROSIVE". Call Fire Department. Stop discharge if safe to do so. Contain spill by diking. Contact manufacturer. Contact environmental authorities.

Protective Clothing and Equipment

In fires, Respiratory protection - self-containing breathing apparatus; otherwise rubber gloves and goggles, protective clothing - with pants worn outside boots.

Fire and Explosion

Solutions not combustible. Most fire extinguishing agents may be used in fire involving NaOCl. Cool fire-exposed containers with water. Pentahydrate and anhydrous forms are not stable. Decomposes in fires generating toxic and corrosive chlorine gas.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - flush with water. Ingestion: if victim is conscious, give milk or water to drink. Keep victim warm. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SODIUM NITRATE $NaNO_3$

IDENTIFICATION

UN No. 1498

Common Synonyms	Observable Characteristics	Manufacturers
CHILE SALTPETER SODA NITER NITRATINE	Colourless to white crystals or powder. Odourless.	No Canadian manufacturer. Selected U.S. manufacturer: Olin Corporation, Lake Charles, Louisiana, USA Canadian supplier: Canadian Industries Limited, Toronto, Ont. (and branches across Canada).

Transportation and Storage Information

Shipping State: Solid. **Classification:** Oxidizing material. **Inert Atmosphere:** No requirement. **Venting:** Open.	**Label(s):** Yellow label - OXIDIZER; Class 5.1, Group III. **Storage Temperature:** Ambient.	**Grades or Purity:** Technical, synthetic - 99.4% $NaNO_3$ min. **Containers and Materials:** Polyethylene-lined paper bags. Carloads or bulk.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid. **Solubility** (Water): 73 g/100 mL (0°C); 92.1 g/100 mL (25°C); 180 g/100 mL (100°C). **Molecular Weight:** 85.01 **Vapour Pressure:** No information. **Boiling Point:** Decomposes at 380°C.	**Floatability** (Water): Sinks and mixes. **Odour:** Odourless. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** 2.26 (25°C).	**Colour:** Colourless to white. **Explosive Limits:** Explodes at 537°C. **Melting Point:** 307°C.

HAZARD DATA

Human Health

Symptoms: Contact: reddening of skin and eyes. Inhalation: of toxic fumes induces coughing and shortness of breath. Ingestion: dizziness, abdominal cramps, vomiting, convulsions, cyanosis, loss of consciousness.
Toxicology: Highly toxic by ingestion.

TLV® No information. Short-term Inhalation Limits - No information.	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - No information. LD_{Lo} - Oral: rat = 0.20 g/kg

Fire

Fire Extinguishing Agents: Not directly combustible; explodes. In fires involving sodium nitrate, use flooding amounts of water.
Behaviour in Fire: May explode at 537°C. Decomposes with heat to produce toxic NO_x fumes.

Ignition Temperature: 537°C.	**Burning Rate:** No information.

Reactivity

With Water: No reaction; soluble.
With Common Materials: Strong oxidizer, can ignite many organic materials. Reacts violently with antimony, cyanides, sodium hypophosphite, sulfur and charcoal.
Stability: May explode when detonated or heated to 537°C.

Environment

Water: Prevent entry into water intakes or waterways. Fish toxicity: 665 mg/L/96 h/*Daphnia magna*/TLm/freshwater; BOD: Not available.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

OXIDIZER.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "OXIDIZER". Call Fire Department. Stop discharge if safe to do so. Remove unbroken bags or drums from spill area. Dike to contain spill. Contact manufacturer. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - in fires, self-contained breathing apparatus. Otherwise; Gloves - rubber. Safety glasses and work clothing, coveralls, apron, etc.

Fire and Explosion

Not directly combustible; explodes. Emits toxic No_x fumes upon heating. Use flooding amounts of water to extinguish.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: skin - remove clothing and flush with large amounts of water. Inhalation: if in fire, fumes of nitrous oxide may be present. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Ingestion: give milk or water to conscious victim. Induce vomiting. If medical assistance is not quickly available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss cleanup and disposal of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss cleanup and disposal of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SODIUM PENTACHLOROPHENATE NaC_6C1_5O

IDENTIFICATION

UN No. 2567

Common Synonyms	Observable Characteristics	Manufacturers
SODIUM PENTACHLOROPHENOLATE DOWICIDE-G SODIUM PENTACHLOROPHENOL SODIUM PENTACHLOROPHENOXIDE PENTACHLOROPHENOL, SODIUM SALT	White to light-brown powder. Slight, characteristic odour (phenolic or carbolic odour).	No Canadian manufacturers. Canadian suppliers: P. Leiner & Sons, Toronto, Ont. Monsanto Canada, Mississauga, Ont. Originating from: W.R. Grace & Co. USA, Monsanto, USA

Transportation and Storage Information

Shipping State: Solid. **Classification:** Poison. **Inert Atmosphere:** No requirement. **Venting:** Open.	**Label(s):** White label - POISON; Class 6.1, Group II. **Storage Temperature:** Ambient.	**Grades or Purity:** Technical. **Containers and Materials:** Bags, drums, carlots.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid. **Solubility (Water):** 33 g/100 mL (25°C.) **Molecular Weight:** 288.4 **Vapour Pressure:** 0.0002 mm Hg (25°C). **Boiling Point:** No information.	**Floatability (Water):** Sinks and mixes. **Odour:** Slight, characteristic (phenolic or carbolic). **Flash Point:** Not flammable. **Vapour Density:** 9.2 **Specific Gravity:** 2.0 (25°C).	**Colour:** White to light brown. **Explosive Limits:** No information. **Melting Point:** No information.

HAZARD DATA

Human Health

Symptoms: Inhalation: nose irritation, nausea and vomiting, coughing, high fever, profuse sweating, rapid difficult breathing; cyanosis, convulsions, loss of consciousness, death due to heart failure, risk of severe pulmonary edema if victim survives. Ingestion: same as inhalation. Contact: skin and eyes - irritation, inflammation and blisters.
Toxicology: Highly toxic by all routes.

TLV® (skin) 0.5 mg/m^3 (as pentachlorophenol). Short-term Inhalation Limits - (skin) - 1.5 mg/m^3 (15 min).	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - Oral: rat = 0.21 g/kg LD_{50} - Subcutaneous: rat = 0.072 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used in fires involving sodium pentachlorophenate.
Behaviour in Fire: When heated to decomposition, toxic fumes of chlorides are evolved.
Ignition Temperature: No information. **Burning Rate:** No information.

Reactivity

With Water: No reaction; soluble.
With Common Materials: No information.
Stability: Stable.

Environment

Water: Prevent entry into water intakes or waterways. Highly toxic to aquatic life: 20 ppm/algae/growth stopped immediately/freshwater; 0.2-0.6 ppm/19 species fish/lethal range/freshwater; Aquatic toxicity rating: <1 ppm/96 h/TLm/freshwater; BOD: No information.
Land-Air: Toxic to fungi and plants.
Food Chain Concentration Potential: Suspected.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "POISON". Avoid contact and inhalation of dust. Stay upwind. If water is used, dike area to prevent runoff. Notify supplier. Notify environmental authorities.

Protective Clothing and Equipment

In fires, Respiratory protection - self-contained breathing apparatus. Otherwise use dust respirator. Acid suit (jacket and pants) or coveralls. Goggles -(mono), tight fitting. Gloves - neoprene. Boots - high, rubber (pants worn over boots).

Fire and Explosion

Not flammable; in fires involving sodium pentachlorophenate; use water, dry chemical, foam or carbon dioxide to extinguish. Cool fire-exposed containers with water. In fire, wear self-contained breathing apparatus to avoid toxic decomposition products (chlorides).

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid immediately. Inhalation: give artificial respiration if breathing has stopped (not mouth-to-mouth method); give oxygen if breathing is laboured. Contact: skin and eyes - remove dust-contaminated clothing and wash eyes and affected skin with plenty of warm water for at least 15 min. Ingestion: give warm water to conscious victim and induce vomiting. Repeat several times. Keep warm and quiet. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Remove contaminated soil for disposal.
8. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SODIUM PHOSPHATE (dibasic) Na_2HPO_4

IDENTIFICATION

UN No. NA9147

Common Synonyms

DSP
PHOSPHATE OF SODA
DISODIUM HYDROGEN PHOSPHATE
DISODIUM PHOSPHATE
DISODIUM MONOHYDROGEN PHOSPHATE
SODIUM ORTHOPHOSPHATE, SECONDARY
SECONDARY SODIUM PHOSPHATE

Commonly shipped in various forms:
anydrous Na_2HPO_4
dihydrate $Na_2HPO_4 \cdot 2H_2O$
heptahydrate $Na_2HPO_4 \cdot 7H_2O$
dodecahydrate $Na_2HPO_4 \cdot 12H_2O$

Observable Characteristics

Colourless, translucent powders and crystals. Odourless.

Manufacturers

Erco Industries, Port Maitland, Ontario, Buckingham, Que.

Transportation and Storage Information

Shipping State: Solid.
Classification: Class 9.2
Inert Atmosphere: No requirement.
Venting: Open.

Label(s): Not regulated.
Storage Temperature: Ambient.

Grades or Purity: Commercial.
Containers and Materials: Paper bags, drums, barrels.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): dihydrate 100 g/100 mL (50°C), 117 g/100 mL (30°C); anhydrous 1.63 g/100 mL (0°C); heptahydrate 104 g/100 mL (40°C); dodecahydrate 4.2 g/100 mL (0°C), 87 g/100 mL (40°C).
Molecular Weight: anhyd. 142; dihydrate 178; hepta. 268; dodeca. 358.
Vapour Pressure: No information.
Boiling Point: Anhydrous at 240°C is converted to sodium pyrophosphate; dihydrate at 92.5°C loses $2H_2O$; hepta hydrate at 48°C loses $5H_2O$; dodecahydrate at 100°C loses $12H_2O$.

Floatability (Water): Sinks and mixes.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: dihydrate 2.07 (15°C); hepta. 1.68 (25°C); dodeca. 1.52 (25°C).

Colour: Colourless to translucent.
Explosive Limits: Not flammable.
Melting Point: Anhydrous 240°C converted to sodium pyrophosphate; dihydrate 95°C loses $2H_2O$; heptahydrate 48°C loses $5H_2O$; dodecahydrate 35.1°C loses $5H_2O$.

HAZARD DATA

Human Health

Symptoms: Inhalation: of dust may irritate nose and throat. Ingestion: injures mouth, throat and gastrointestinal tract resulting in vomiting, cramps and diarrhea; pain and burning in mouth may occur. Contact: eyes - local irritation to chronic damage; skin - dermatitis.
Toxicology: Low toxicity by ingestion.
TLV®- No information.
Short-term Inhalation Limits - No information.

LC_{50} - No information.
Delayed Toxicity - No Information.

LD_{50} - Oral: rat = 12.9 g/kg (hepta).
LD_{Lo} - Intraperitoneal: rat = 1.0 g/kg (anhydrous).

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used in fires involving sodium phosphate (dibasic).
Behaviour in Fire: Anhydrous forms toxic PO_x upon decomposition in fires.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: No reaction; soluble.
With Common Materials: Reacts violently with magnesium.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. Fish toxicity: 126 ppm/92 h/Daphnia magna/TLm/freshwater.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from site. Avoid contact and inhalation of dust. Dike to prevent runoff. Notify manufacturer or supplier for advice. Notify environmental authorities.

Protective Clothing and Equipment

In fires, Respiratory protection - self-contained breathing apparatus; otherwise, safety goggles or face shield, dust mask, rubber gloves, rubber boots, and protective clothing as required.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used in fires involving sodium phosphate (dibasic). Toxic PO_x fumes are formed upon decomposition in fires.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Dust Contact: eyes - flush with water. Inhalation: if breathing has stopped give artificial respiration; if laboured, give oxygen. Solid Contact: skin - remove contaminated clothing and flush affected areas with water. Ingestion: give conscious victim plenty of water to drink and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SODIUM PHOSPHATE (monobasic) NaH_2PO_4

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
MSP MONOSODIUM DIHYDROGEN PHOSPHATE MONOSODIUM PHOSPHATE SODIUM BIPHOSPHATE SODIUM ACID PHOSPHATE SODIUM ORTHOPHOSPHATE, primary (also shipped as a hydrate $NaH_2PO_4 \cdot H_2O$)	White, crystalline powder. Odourless. Monohydrate - large translucent crystals.	Erco Industries, Port Maitland, Ont. Buckingham, Que.

Transportation and Storage Information

Shipping State: Solid. **Classification:** Not regulated. **Inert Atmosphere:** No requirement. **Venting:** Open.	**Label(s):** Not regulated. **Storage Temperature:** Ambient.	**Grades or Purity:** Technical; commercial. **Containers and Materials:** Paper bags, drums and barrels.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid. **Solubility (Water):** 59.9 g/100 mL (0°C); 427 g/100 mL (100°C) (monohydrate); anhydrous and dihydrate very soluble. **Molecular Weight:** 120 (anhydrous); 138 (monohydrate). **Vapour Pressure:** No information. **Boiling Point:** monohydrate - loses water at 100°C; decomposes at 138°C; anhydrous form forms sodium acid pyrophosphate at 225 to 250°C; and sodium metaphosphate at 350 to 400°C.	**Floatability (Water):** Sinks and mixes. **Odour:** Odourless. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** 2.04 (monohydrate).	**Colour:** White. **Explosive Limits:** Not flammable. **Melting Point:** Decomposes at 204°C; monohydrate loses water at 100°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: of dust may irritate nose and throat. Ingestion: injures mouth, throat and gastrointestinal tract resulting in vomiting, cramps and diarrhea; pain and burning in mouth may occur. Contact: eyes - local irritation to chronic damage, skin - dermatitis.
Toxicology: Low by all routes.

TLV® No information. Short-term Inhalation Limits - No information.	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - Intramuscular: rat = 0.25 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used in fires involving sodium phosphate (monobasic).
Behaviour in Fire: At high temperatures, forms highly toxic PO_x fumes.

Ignition Temperature: Not combustible.	**Burning Rate:** Not combustible.

Reactivity

With Water: None; soluble (forms a weak acidic solution with water).
With Common Materials: Reacts violently with magnesium.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. Fish toxicity: 126 ppm/72 h/Daphnia magna/TLm/freshwater.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from site. Avoid contact and inhalation of dust. Dike to prevent runoff. Notify manufacturer. Notify environmental authorities.

Protective Clothing and Equipment

In fires, Respiratory protection - self-contained breathing apparatus; otherwise, safety goggles or face shield, dust mask, rubber gloves, rubber boots, and protective clothing as required.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used in fires involving sodium phosphate (monobasic). At high temperatures PO_x fumes are emitted.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Dust: Contact: eyes - flush with water. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Solid: Contact: skin - remove contaminated clothing and flush affected areas with water. Ingestion: induce vomiting in conscious victim; give water to drink and keep warm. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SODIUM PHOSPHATE (tribasic) $Na_3PO_4 \cdot 12H_2O$

IDENTIFICATION

UN No. NA9148

Common Synonyms

TSP
SODIUM ORTHOPHOSPHATE
SODIUM PHOSPHATE
TRIBASIC SODIUM PHOSPHATE
TRISODIUM ORTHOPHOSPHATE

Forms: dodecahydrate $Na_3PO_4 \cdot 12H_2O$
Note: Information on this sheet is for the dodecahydrate, the most commonly shipped form.

Observable Characteristics

Crystals. Odourless. Clear to white.

Manufacturers

Erco Industries.
Port Maitland, Ontario,
Buckingham, Quebec.

Transportation and Storage Information

Shipping State: Solid.
Classification: Class 9.2.
Inert Atmosphere: No requirement.
Venting: Open.

Label(s): Not required.
Storage Temperature: Ambient.

Grades or Purity: Commercial, CP.
Containers and Materials: Barrels and bags.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): 1.5 g/100 mL (0°C); 28.3 g/100 mL (15°C); 157 g/100 mL (70°C).
Molecular Weight: 380.12
Vapour Pressure: No information.
Boiling Point: 73 to 77°C decomposes; loses $12H_2O$ at 100°C.

Floatability (Water): Sinks and mixes.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: 1.62 (20°C).

Colour: Clear to white.
Explosive Limits: Not flammable.
Melting Point: Decomposes at 73 to 77°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: nose, eyes and throat, irritation; sneezing, difficulty in breathing, coughing. Ingestion: burning sensation in mouth, pain in swallowing, stomach cramps. Contact: skin - itching, burning sensation, inflammation; eyes - irritation and burning.
Toxicology: Moderately toxic by ingestion and inhalation.
TLV®- No information.
Short-term Inhalation Limits - No information.
LC_{50} - No information.
Delayed Toxicity - No information.
LD_{50} - Oral: rat = 7.4 g/kg (hepta.)

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used in fires involving sodium phosphate (tribasic).
Behaviour in Fire: Not combustible, but at high temperatures degrades and gives off toxic PO_x fumes.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: No reaction; soluble. Solutions are caustic.
With Common Materials: Reacts violently with magnesium.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life; Fish toxicity: 126 ppm/72 h/Daphnia magna/TLm/freshwater.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from site. Avoid contact and inhalation of dust. Dike to prevent runoff. Notify manufacturer or supplier. Notify environmental authorities.

Protective Clothing and Equipment

In fires, Respiratory protection - self-contained breathing apparatus; otherwise, safety goggles or face shield, dust mask, rubber gloves, rubber boots, and protective clothing as required.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used in fires involving sodium phosphate (tribasic). Emits toxic PO_x fumes upon heating.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Dust Contact: eyes - flush with water. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Solid Contact: skin - remove contaminated clothing and flush affected areas with water. Ingestion: give plenty of water to conscious victim and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SODIUM SILICATE $Na_2O \cdot nSiO_2 \cdot xH_2O$ (n = 1 to 5)

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
SILICATE OF SODA WATER GLASS SODIUM METASILICATE (n=1).	Colourless to greenish-white powder. Odourless. Solutions are also colourless to green-white and viscous in appearance.	National Silicates Ltd., Toronto, Ont. Valleyfield, Que.

Transportation and Storage Information

Shipping State: Solid or liquid (aqueous solution). **Classification:** Not regulated. **Inert Atmosphere:** No requirement. **Venting:** Open. **Pump Type:** Gear, centrifugal steel, stainless steel (for solutions).	**Label(s):** Not regulated. **Storage Temperature:** Ambient. **Hose Type:** Hypalon, polyethylene, polypropylene, natural rubber.	**Grades or Purity:** 40, 47, 52° Bé. **Containers and Materials:** Drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid. **Solubility** (Water): Soluble to very soluble depending on form. **Molecular Weight:** Varies (122 to 288). **Vapour Pressure:** No information. **Boiling Point:** Solutions decompose at about 100°C.	**Floatability** (Water): Sinks and mixes. **Odour:** Odourless. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** (solution) 1.1 to 1.8 (20°C); (solid) 2.4 (metasilicate).	**Colour:** Colourless to greenish-white. **Explosive Limits:** Not flammable. **Melting Point:** Variable, solutions decompose at about 100°C. Solids: disilicate 874°C; metasilicate 1 088°C; orthosilicate 1 018°C.

HAZARD DATA

Human Health

Symptoms: Contact: skin - burning and inflammation; eyes - pain, watering. Ingestion: burning, nausea, vomiting and stomach cramps. Inhalation: sneezing, difficulty in breathing, coughing fits and chemical bronchitis.
Toxicology: Low toxicity by all routes.

TLV® No information. Short-term Inhalation Limits - No information.	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - Oral: mouse = 1.10 g/kg LD_{50} - Oral: rat = 1.30 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used on fires involving sodium silicate.
Behaviour in Fire: Not combustible.
Ignition Temperature: Not combustible. **Burning Rate:** Not combustible.

Reactivity

With Water: No reaction, soluble.
With Common Materials: Reacts violently with fluorine.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life in high concentrations. Fish toxicity: 2 320 ppm/96 h/mosquito fish/TLm/freshwater; 216 ppm/96 h/Daphnia magna/TLm/lake water; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from spill site. Contain spill by diking if there is water runoff from fire or rain. Avoid contact and inhalation. Notify manufacturer. Notify environmental authorities.

Protective Clothing and Equipment

Safety goggles - tight fitting. Rubber gloves. Protective work clothing, as required.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used on fires involving sodium silicate.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: remove contaminated clothing and wash eyes and skin thoroughly with plenty of water. Ingestion: give water or milk to conscious victim. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Contaminated materials may be buried in a secured landfill site (with environmental authorities' approval).

SODIUM SULFATE $Na_2SO_4 \cdot xH_2O$ (x = 0, 7, 10)

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
DISODIUM SULFATE GLAUBER'S SALT ($Na_2SO_4 \cdot 10H_2O$)(decahydrate) SALT CAKE Also occurs in two basic mineral forms: thenardite and metathenardite; heptahydrate and decahydrate forms.	White crystals or powder. Odourless.	Saskatchewan Minerals, Chaplin, Sask. Ormiston Mining and Smelting, Ormiston, Fox Valley, Sask., Alberta Sulfate, Metiskow, Alta.

Transportation and Storage Information		
Shipping State: Solid. **Classification:** None. **Inert Atmosphere:** No requirement. **Venting:** Open.	**Label(s):** Not regulated. **Storage Temperature:** Ambient.	**Grades or Purity:** Technical and CP. **Containers and Materials:** Bags, drums or bulk.

Physical and Chemical Characteristics		
Physical State (20°C, 1 atm): Solid. **Solubility (Water):** thenardite 4.7 g/100 mL (0°C); 42.7 g/100 mL (100°C); metathenardite 48.8 g/100 mL (40°C); heptahydrate 19.5 g/100 mL (0°C); 44 g/100 mL (20°C); decahydrate 11 g/100 mL (0°C); 36 g/100 mL (15°C); 92.7 g/100 mL (30°C). **Molecular Weight:** 142 anhydrous; 268 hepta.; 322 decahydrate. **Vapour Pressure:** No information. **Boiling Point:** Loses $10H_2O$ at 100°C (decahydrate).	**Floatability (Water):** Sinks and mixes. **Odour:** Odourless. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** thenardite 2.66, metathenardenite 2.70, decahydrate 1.46 (25°C).	**Colour:** White. **Explosive Limits:** Not flammable. **Melting Point:** Hepta turns to anhydrous at 24.4°C; anhydrous 884°C; decahydrate 32.4°C.

HAZARD DATA

Human Health

Symptoms: Ingestion: low toxicity. Contact: skin - not irritating, but prolonged contact with concentrated solutions or powders should be avoided; eyes - mechanical irritation and watering.
Toxicology: Low toxicity by all routes.

TLV®- No information.	LC_{50} - No information.	LD_{50} - Oral: mouse = 5.99 g/kg (anhydrous)
Short-term Inhalation Limits - No information.	Delayed Toxicity - No information.	

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used in fires involving sodium sulfate.
Behaviour in Fire: Not combustible.

Ignition Temperature: Not combustible.	**Burning Rate:** Not combustible.

Reactivity

With Water: No reaction; soluble.
With Common Materials: Reacts violently with aluminum under certain circumstances.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicities: 13,500 ppm/96 h/bluegill/LC_{50}/freshwater; 5 200 ppm/48 h/Daphnia magna/ LC_{100}/freshwater; 16,500 ppm/96 h/mosquito fish/TLm/freshwater.
Land-Air: 7 500 mg/L/15 days/poultry/LC_{33}.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from spill site. Avoid contact and inhalation. Dike to prevent runoff from water application or rainwater. Notify manufacturer. Notify environmental authorities.

Protective Clothing and Equipment

Safety goggles - (tight fitting). Rubber gloves. Protective clothing, as required.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used in fires involving sodium silicate.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: remove contaminated clothing and wash eyes and skin thoroughly with plenty of water. Ingestion: give water or milk to conscious victim. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water
1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air
1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Contaminated materials may be buried in a secured landfill site (with environmental authorities' approval).

SODIUM SULFITE Na_2SO_3

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
Found in two forms: anhydrous and heptahydrate. ($Na_2SO_3.7H_2O$)	White crystals or powder. Odourless.	International Paper Consolidated. Matane, Que. Abitibi-Price, Kenogami, Que. Bathurst, Bathurst, NB. Lake Utopia Paper, St-George, N.B.

Transportation and Storage Information

Shipping State: Solid.	**Label(s):** Not regulated.	**Grades or Purity:** Technical anhydrous; 90 ±1%.
Classification: None.	**Storage Temperature:** Ambient.	**Containers and Materials:** Bags and drums.
Inert Atmosphere: No requirement.		
Venting: Open.		

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.	**Floatability** (Water): Sinks and mixes.	**Colour:** White.
Solubility (Water): Anhydrous 12.5 g/100 mL (0°C); 28.3 g/100 mL (80°C); heptahydrate: 32.8 g/100 mL (0°C); 196 g/100 mL (40°C).	**Odour:** Odourless.	**Explosive Limits:** Not flammable.
	Flash Point: Not flammable.	**Melting Point:** Decomposes.
Molecular Weight: 126 (anhyd.), 252 (heptahydrate).	**Vapour Density:** No information.	
Vapour Pressure: No information.	**Specific Gravity:** 2.63 at 15°C (anhydrous); 1.54 at 15°C (heptahydrate).	
Boiling Point: Decomposes (hydrate loses $7H_2O$ at 150°C).		

HAZARD DATA

Human Health

Symptoms: Inhalation: (dust) sore throat, coughing, shortness of breath. Contact: skin and eyes - causes redness, pain, inflammation. Ingestion: violent and chronic diarrhea, circulatory disturbances, central nervous system depression and death.
Toxicology: Moderately toxic by ingestion.

TLV - No information.	LC_{50} - No information.	LD_{50} - Intravenous: rat = 0.115 g/kg (anhydrous).
Short-term Inhalation Limits - No information.	Delayed Toxicity - No information.	LD_{Lo} - Oral: rabbit = 2.83 g/kg (anhydrous).
		LD_{50} - Intraperitoneal: mouse = 0.277 g/kg (hepta).

Fire

Fire Extinguishing Agents: Not combustible. In fires involving sodium sulfite, most fire extinguishing agents may be used.
Behaviour in Fire: Not combustible.

Ignition Temperature: Not combustible.	**Burning Rate:** Not combustible.

Reactivity

With Water: No reaction; soluble.
With Common Materials: No information.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Hazardous to aquatic life in high concentrations. Fish toxicity: 2 600 ppm/24, 48 and 96 h/ mosquito fish/TLm/freshwater; BOD: 12%.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from spill site. Avoid contact. Dike area to prevent runoff from rainwater. Contact manufacturer. Contact environmental authorities.

Protective Clothing and Equipment

Safety goggles - tight fitting. Rubber gloves. Protective clothing as required.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used in fires involving sodium sulfite.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: remove contaminated clothing and wash with plenty of water. Ingestion: give water or milk to conscious victim. If medical help is not immediately available, transport victim to clinic, doctor or hospital.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Contaminated materials may be buried in a secured landfill site (with approval of environmental authorities).

STEARIC ACID $CH_3(CH_2)_{16}CO_2H$

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
HYDROFOL ACID OCTADECANOIC ACID n-OCTADECYLIC ACID STEAROPHANIC ACID 1-HEPTADECACARBOXYLIC ACID	White to pale yellow solid with a slight fatty odour.	Proctor and Gamble Canada, Hamilton, Ont. Emery Industries, Toronto, Ontario. Canada Packers, Toronto, Ontario. Armak Chemicals, Saskatoon, Saskatchewan.

Transportation and Storage Information

Shipping State: Solid.
Classification: Not regulated.
Inert Atmosphere: No requirement.
Venting: Open.

Label(s): Not regulated.
Storage Temperature: Ambient.

Grades or Purity: USP; Commercial; triple pressed; double pressed. Most commercial "stearic acid" is 45% palmitic acid, 50% stearic acid, and 5% oleic acid.
Containers and Materials: Cans, barrels, bags, bulk by truck and train.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): 0.034 g/100 mL (25°C); 0.1 g/100 mL (87°C).
Molecular Weight: 284.5
Vapour Pressure: 1.0 mm Hg (173.7°C).
Boiling Point: 361 to 383°C (may also decompose at these temperatures).

Floatability (Water): Floats.
Odour: Tallow-like; 20 ppm odour threshold.
Flash Point: 196°C (c.c.).
Vapour Density: 9.8
Specific Gravity: 0.94 at 20°C.

Colour: White to pale yellow.
Explosive Limits: No information.
Melting Point: 69 to 72°C.

HAZARD DATA

Human Health

Symptoms: Generally considered nontoxic. Inhalation of dust irritates nose and throat. Dust causes mild eye irritation.
Toxicology: Low toxicity by all routes.

TLV® No information.	LC_{50} - No information.	LD_{50} - Intravenous: rat = 0.022 g/kg
Short-term Inhalation Limits - No information.	Delayed Toxicity - No information.	LD_{50} - Intravenous: mouse = 0.056 g/kg

Fire

Fire Extinguishing Agents: Dry chemical or carbon dioxide. Water or foam may cause frothing. Use water spray to keep fire-exposed containers cool.
Behaviour in Fire: No severe toxic products are produced by combustion.
Ignition Temperature: 395°C.
Burning Rate: No information.

Reactivity

With Water: No reaction.
With Common Materials: No information.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. BOD: 144%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

COMBUSTIBLE.

Immediate Responses

Keep non-involved people away from spill site. Call Fire Department. Avoid contact with solid and dust. Stop discharge if safe to do so. Notify manufacturer. Notify environmental authorities.

Protective Clothing and Equipment

Safety goggles - tight fitting. Rubber gloves. Protective clothing as required.

Fire and Explosion

Dry chemical or carbon dioxide. Water or foam may cause frothing.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Dust Contact: eyes - flush with water. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. Solid Contact: remove contaminated clothing and flush affected areas with water; eyes - flush with water. Ingestion: if victim is conscious, give milk or water to drink and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Contaminated materials may be buried in a secured landfill site (with environmental authorities' approval).

STYRENE MONOMER (inhibited) $C_6H_5CH{=}CH_2$

IDENTIFICATION

UN No. 2055

Common Synonyms	Observable Characteristics	Manufacturers
VINYLBENZENE PHENYLETHYLENE CINNAMENE ETHENYLBENZENE STYROL	Colourless to yellowish liquid. Sweet odour.	Polysar, Sarnia, Ontario. Dow Chemical Canada Inc., Sarnia, Ontario.

Transportation and Storage Information

Shipping State: Liquid. **Classification:** Flammable liquid. **Inert Atmosphere:** No requirement. **Venting:** Open (flame arrester). **Pump Type:** Centrifugal, gear; steel, most materials not containing copper.	**Label(s):** Red label - FLAMMABLE; Class 3.2, Group II. **Storage Temperature:** Ambient. **Hose Type:** Fluoroelastomer, stainless steel, Teflon.	**Grades or Purity:** Commercial, 99.5% min; technical, 99.2%; polymer, 99.6%. **Containers and Materials:** Tank cars, tank trucks, drums, cans; steel, galvanized iron, black iron.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility** (Water): 0.028 g/100 mL (15°C); 0.03 g/100 mL (20°C); 0.04 g/100 mL (40°C). **Molecular Weight:** 104.2 **Vapour Pressure:** 4.3 mm Hg (15°C); 9.5 mm Hg (30°C). **Boiling Point:** 145.2°C.	**Floatability** (Water): Floats. **Odour:** Sweet odour (0.15 to 25 ppm, odour threshold). **Flash Point:** 37°C (o.c.); 32°C (c.c.). **Vapour Density:** 3.6 **Specific Gravity:** 0.91 (25°C).	**Colour:** Colourless to yellow. **Explosive Limits:** 1.1 to 6.1%. **Melting Point:** -31°C.

HAZARD DATA

Human Health

Symptoms: Contact: eyes - irritation, possibly slight transient corneal injury; skin - moderate irritation upon prolonged or repeated contact. Not likely to be absorbed through skin in toxic amounts. Ingestion: irritation of lips, mouth and throat; pain in swallowing, abdominal pain, nausea and vomiting, diarrhea, shock, convulsions may occur. Inhalation: irritation of mucous membranes, difficulty in breathing, coughing, bluish face and lips, dizziness, fatigue, pneumonia.
Toxicology: Moderate toxicity by inhalation or ingestion.

TLV®- (inhalation) 50 ppm; 215 mg/m^3. Short-term Inhalation Limits - 100 ppm; 425 mg/m^3 (15 min).	LC_{50} - No information. TC_{Lo} - Inhalation: human = 376 to 600 ppm Delayed Toxicity - Possible kidney damage from ingestion. Suspected carcinogen.	LD_{50} - Oral: rat = 5.0 g/kg

Fire

Fire Extinguishing Agents: Use dry chemical, foam or carbon dioxide; water may be ineffective but may be used to keep fire-exposed containers cool and knock down vapours.
Behaviour in Fire: At elevated temperatures, polymerization may occur. Fire-exposed containers may rupture. Flashback may occur along vapour trail.
Ignition Temperature: 490°C. **Burning Rate:** 5.2 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Reacts vigorously with oxidizers and metallic halides. Reacts violently with chlorosulfonic acid, oleum and sulfuric acid.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 22 ppm/96 h/bluegill/TLm/freshwater; 26 mg/L/24 h/goldfish/LD_{50}/freshwater; 68 mg/L/24 h/brine shrimp/TLm/saltwater; Aquatic toxicity rating = 10 to 100 ppm/96 h/TLm/freshwater; BOD: 55 to 195%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE. May polymerize violently upon heating.

Immediate Responses

Keep non-involved people away from spill area. Issue warning: "FLAMMABLE". Call Fire Department. Eliminate all ignition sources. Avoid contact and inhalation. Call manufacturer or supplier for guidance. Contain spill by diking. Stop or reduce discharge, if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

In fires, Respiratory protection - self-contained breathing apparatus; otherwise, Goggles - (mono), tight fitting; Gloves - rubber. Boots - high, rubber (pants worn outside boots). Protective clothing - coveralls. In major spill or fire - totally encapsulated suit.

Fire and Explosion

Dry chemical, foam or CO_2 to extinguish. At elevated temperatures, such as in fire, polymerization may occur. Fire-exposed container, may rupture. Fire may flash back along vapour trail.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: eyes - irrigate with plenty of water immediately for at least 15 minutes; skin - flush with plenty of water for at least 15 minutes; at same time, remove contaminated clothing. Inhalation: if breathing stops, give artificial respiration; if laboured, give oxygen. Do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier. Pump water into area to prevent soil penetration.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Remove material by manual or mechanical means.
6. Recover undamaged containers.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SULFUR S_8

IDENTIFICATION

UN No. 1350
2448 molten

Common Synonyms	Observable Characteristics	Manufacturers
SULPHUR BRIMSTONE FLOWERS OF SULFUR SULFUR FLOUR	Yellowish powder or lumps. Pure is odourless; with impurities, faint rotten-eggs type odour.	Aquitaine of Canada, Ram River, Alta. Chevron Standard, Kayob, Alta. Shell Canada, Waterton, Alta. Amoco/Texasgulf, Windfall, Alta.

Transportation and Storage Information

Shipping State: Solid, liquid (molten).
Classification: Not regulated.
Inert Atmosphere: No requirement.
Venting: No requirement.
Pump Type: Centrifugal; steel, stainless steel. Relevant for molten material only.

Label(s): Voluntary
red and white striped label - FLAMMABLE; Class 4.1, Group III.
Storage Temperature: Ambient (molten, 142°C).
Hose Type: Flexible steel or stainless steel. Molten material only.

Grades or Purity: Technical, crude, refined, high purity.
Containers and Materials: Bags, barrels, bulk, carlots or truck loads.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): Insoluble.
Molecular Weight: 256.5 (atomic weight: 32.1)
Vapour Pressure: <0.0001 mm Hg (20°C); 0.11 mm Hg (140°C); 1 mm Hg (184°C); 10 mm Hg (244°C).
Boiling Point: 444.6°C.

Floatability (Water): Sinks (finely divided powder may trap air and remain floating).
Odour: Faint rotten-egg odour (impure); pure form odourless.
Flash Point: Pure sulfur, 188 to 207°C; impure sulfur as low as 168°C.
Vapour Density: 8.9
Specific Gravity: 1.92 to 2.07 (20°C); 1.80 (molten) (120°C).

Colour: Yellow.
Explosive Limits: 35 to 1 400 g/m^3 dust.
Melting Point: 113 to 122°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: sore throat, coughing. Contact: eyes and skin - (dust) irritation (burns with molten). Ingestion: irritation of mouth, sore throat, diarrhea.
Toxicology: Low toxicity by all routes.
TLV®- No information.
Short-term Inhalation Limits - No information.
LC_{50} - No information.
Delayed Toxicity - No information.
LD_{50} - No information.

Fire

Fire Extinguishing Agents: Use dry chemical, carbon dioxide or water spray. Avoid straight streams of water which will scatter molten sulfur and dust.
Behaviour in Fire: Produces toxic SO_x fumes. Dust may explode if there is an ignition source.
Ignition Temperature: 232 to 266°C (190°C; dust).
Burning Rate: No information.

Reactivity

With Water: No reaction.
With Common Materials: May react with oxidizing materials under some conditions. Reacts violently with halogens, carbides, zinc, tin, sodium, nickel, phosphorus, potassium, calcium, aluminum, ammonia, ammonium nitrate, potassium permanganate, ammonium perchlorate, barium halites, bromates, calcium chlorate, calcium hypochlorite, calcium iodate, charcoal, chlorates, chlorine oxides, chromic anhydride, fluorine, hydrocarbons, iodates, lead halides, lead dioxide, lithium, magnesium halides, mercury oxides, perchlorates, potassium halides, potassium perchlorate, silver halides, sodium halides, sodium nitrate and zinc halides.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life in high concentrations. Fish toxicity: 10 000 ppm/96 h/mosquito fish/TLm/freshwater; 16 000 ppm/5 h/goldfish/LC_{100}/freshwater (as colloidal suspension); 2 100 ppm/1 h/goldfish/LC_{100} freshwater; BOD: No information.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

COMBUSTIBLE.

Immediate Responses

Keep non-involved persons away from spill site. Issue warning: "COMBUSTIBLE". Call Fire Department. Call supplier for advice. Avoid contact and inhalation. Stop discharge if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

In fires, Respiratory protection - self-contained breathing apparatus; otherwise; Goggles - (mono), tight fitting. Gloves - boots - coveralls.

Fire and Explosion

Use dry chemical, carbon dioxide or water spray. Avoid straight streams of water. Toxic SO_x fumes produced in fires.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: eyes - irrigate with plenty of warm water for at least 15 minutes. Inhalation: remove to fresh air. If breathing has stopped, give artificial respiration; if laboured, give oxygen. Ingestion: give water to conscious victim to drink. Induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SULFUR DIOXIDE SO_2

IDENTIFICATION

UN No. 1079

Common Synonyms	Observable Characteristics	Manufacturers
SULFUROUS ACID, ANHYDRIDE SULFUROUS OXIDE	Colourless liquid or gas. Strong, pungent odour.	Canadian Industries Ltd., Copper Cliff, Ont. Cominco Ltd., Trail, B.C.

Transportation and Storage Information

Shipping State: Gas or liquid (compressed gas).
Classification: Poison.
Inert Atmosphere: No requirement.
Venting: Safety-relief valve.
Pump Type: No information.

Label(s): White label - POISON; Class 2.3.
Storage Temperature: Ambient.
Hose Type: Flexible steel or stainless steel.

Grades or Purity: Commercial, 99.9% SO_2; refrigeration, 99.98% SO_2.
Containers and Materials: Cylinders, ton containers, tank cars; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas.
Solubility (Water): 23 g/100 mL (0°C); 0.58 g/100 mL (90°C).
Molecular Weight: 64.1
Vapour Pressure: 2 538 mm Hg (21°C).
Boiling Point: -10°C.

Floatability (Water): Mixes (liquid SO_2 sinks).
Odour: Strong, pungent (3 ppm, odour threshold).
Flash Point: Not flammable.
Vapour Density: 2.3 (0°C).
Specific Gravity: (liquid) 1.45 (-10°C).

Colour: Colourless.
Explosive Limits: Not flammable.
Melting Point: -75.8°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: sore throat, coughing, shortness of breath, laboured breathing, bronchitis, respiratory paralysis. Contact: eyes - blurred vision, redness, pain; skin - redness, pain, burns. Contact with liquid produces frostbite.
Toxicology: Highly toxic by all routes.
TLV® (inhalation) 2 ppm; 5 mg/m^3.
Short-term Inhalation Limits - 5 ppm; 10 mg/m^3 (15 min).

LC_{50} - No information.
LC_{Lo} - Human: Inhalation = 400 ppm (1 min).
TC_{Lo} - Human: Inhalation = 4 ppm (1 min).
Delayed Toxicity - No information.

LD_{50} - No information.

Fire

Fire Extinguishing Agents: Not combustible. Stop flow of gas before attempting to extinguish fire. Most fire extinguishing agents may be used on fires involving sulfur dioxide. In fires involving SO_2, cool fire-exposed containers with water.
Behaviour in Fire: Not combustible.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: Soluble; reacts to form sulfurous acid.
With Common Materials: Reacts violently with acrolein, aluminum, chlorates, chromium, ferrous oxide, fluorine, manganese, potassium chlorate, sodium carbide and stannous oxide.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. Fish toxicity: 5 ppm/1 h/trout/LC_{100}/freshwater; 16 ppm/1 h/sunfish/LC_{100}/freshwater; BOD: No information.
Land-Air: Concentrations >1 ppm injurious to plant foliage.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "POISON". Call Fire Department. Contact manufacturer for advice and assistance. Shut off leak; if safe to do so. In cold weather, if liquid SO_2 is discharging, it may be possible to safely dike the spill, wearing full protective equipment. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - use self-contained breathing apparatus. Gloves - rubber. Outerwear - coveralls or gas tight suit in high gas concentrations.

Fire and Explosion

Not combustible. Stop flow of gas before attempting to extinguish fire. Most fire extinguishing agents may be used on fires involving sulfur dioxide. In fires involving sulfur dioxide, cool fire-exposed containers with water.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: eyes - irrigate with plenty of water for at least 15 minutes. If pain persists, irrigate for another 15 minutes; skin - flush skin immediately with plenty of soapy water for at least 15 minutes. At same time remove contaminated clothing. Treat as for frostbite. Inhalation: if breathing has stopped, start artificial respiration at once. If breathing is laboured, administer oxygen. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water
1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air
1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier, if possible.
4. Recover undamaged containers.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SULFURIC ACID H_2SO_4

IDENTIFICATION

UN No. 1832

Common Synonyms	Observable Characteristics	Manufacturers
HYDROGEN SULPHATE FERTILIZER ACID BATTERY ACID DIPPING ACID (See Oleum for concentrated solutions).	Colourless to brown liquid. Sharp, penetrating odour.	(CIL) Canadian Industries Ltd., Copper Cliff, Ont. ESSO Chemicals Canada, Redwater, Alta. Texasgulf Canada, Timmins, Ontario. Western Co-operative Fertilizers, Calgary, Alta.

Transportation and Storage Information

Shipping State: Liquid. **Classification:** Corrosive liquid. **Inert Atmosphere:** No requirement. **Venting:** Open. **Pump Type:** Centrifugal; alloy 20 (for 70% and up).	**Label(s):** White and black label - CORROSIVE; Class 8, Group II. **Storage Temperature:** Ambient. **Hose Type:** Chemiflex 951 (polypropylene), flexible stainless steel - rigid pipe and swivel joints.	**Grades or Purity:** Commercial, 52° Bé 65.1% H_2SO_4; 58° Bé 74.4% H_2SO_4; 60° Bé 77.7% H_2SO_4; 66° Bé 93.2% H_2SO_4. **Containers and Materials:** Bottles, carboys, (lined) drums, tank trucks, tank cars; stainless steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility (Water):** Soluble in all proportions. **Molecular Weight:** 98.1 (pure). **Vapour Pressure:** ~1 mm Hg at 38°C for 66° Bé. **Boiling Point:** (66° Bé), ~281°C.	**Floatability (Water):** Sinks and mixes. May react vigorously. **Odour:** Sharp, penetrating (1 mg/m^3 odour threshold). **Flash Point:** Not flammable. **Vapour Density:** 2.8 (20°C) (SO_3). **Specific Gravity:** 52° Bé 1.56; 58° Bé 1.67; 60° Bé 1.71; 66° Bé 1.84.	**Colour:** Clear to dark brown. **Explosive Limits:** Not flammable. **Melting Point:** (66° Bé), -32°C; 100% 10.4°C; (52° Bé), - 40°C; 58° Bé, -44°C; (60° Bé), -8°C.

HAZARD DATA

Human Health

Symptoms: Highly concentrated sulfuric acid is rapidly destructive to body tissues on contact. Contact: skin - dermatitis and burns; eyes - rapidly causes severe damage, and possible loss of sight. Inhalation: of concentrated vapour or mist will cause damage to the upper respiratory tract and lung tissue, sore throat, coughing, laboured breathing. Ingestion: sore throat, abdominal pain, nausea and vomiting.

Toxicology:

TLV*- (inhalation) 1 mg/m^3.	LC_{50} - Inhalation: guinea pig = 18 mg/m^3.	LD_{50} - Oral: rat = 2.14 g/kg
Short-term Inhalation Limits - No information.	Delayed Toxicity - None known.	

Fire

Fire Extinguishing Agents: Not combustible. Use dry chemical to fight adjacent fires.
Behaviour in Fire: Not combustible. In fires, toxic SO_x fumes may be released. May react with metals producing flammable H_2 gas.
Ignition Temperature: Not combustible. **Burning Rate:** Not combustible.

Reactivity

With Water: Soluble. Concentrated solutions may react violently producing toxic SO_x fumes.
With Common Materials: Powerful oxidizer; concentrated solutions may ignite organic materials. Can react violently with acetic anhydride, acetonitrile, acrolein, acrylonitrile, allyl alcohol, allyl chloride, ammonium hydroxide, aniline, n-butyraldehyde, carbides, chlorates, chlorosulfonic acid, epichlorohydrin, ethylenediamine, ethylene glycol, hydrochloric acid, hydrofluoric acid, iron, isoprene, metals (powdered), perchlorates, phosphorus, potassium-t-butoxide, potassium permanganate, propylene oxide, pyridine, sodium, sodium carbonate, sodium chlorate, sodium hydroxide, steel, styrene monomer, vinyl acetate and zinc chlorate.
Stability: Stable (within the limits of the foregoing).

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. Fish toxicity: 10 to 24.5 mg/L/24 h/bluegill/lethal/freshwater; 45.2 ppm/48 h/prawn/LC_{50}/saltwater; 138 ppm/4 h/goldfish/lethal/freshwater; 80 to 90 ppm/48 h/shrimp/LC_{50}/saltwater; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE. Reactive with water and other common materials.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "CORROSIVE". Call Fire Department. Eliminate all ignition sources. Contact manufacturer for advice. Contain spill by diking with earth or other material. Avoid inhalation and contact. Stop or reduce discharge if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Gloves - gauntlet type, rubber, vinyl, Boots - high, rubber or neoprene (pants worn outside boots).

Fire and Explosion

Not combustible. Avoid use of water. Toxic SO_x fumes are released in fires.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: eyes - irrigate immediately with plenty of water; skin - flush with plenty of water, and remove contaminated clothing. Ingestion: give plenty of water to conscious victim to drink to reduce acid concentration. Do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Remove material by manual or mechanical means.
6. Remove contaminated soil for disposal or neutralize with lime.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

SULFURYL CHLORIDE SO_2Cl_2

IDENTIFICATION

UN No. 1834

Common Synonyms	Observable Characteristics	Manufacturers
SULFONYL CHLORIDE SULFURIC OXYCHLORIDE CHLOROSULFURIC ACID SULFURIC CHLORIDE	Colourless to yellow. Acrid, choking odour.	

Transportation and Storage Information

Shipping State: Liquid. **Classification:** Corrosive. **Inert Atmosphere:** No requirement. **Venting:** Pressure-vacuum.	**Label(s):** Black and white label - CORROSIVE. **Storage Temperature:** Ambient.	**Grades or Purity:** Technical 99%. **Containers and Materials:** Drums, carbuoys; plastic-lined or steel.

Physical and Chemical Characteristics

Physical State: Liquid. **Solubility (Water):** Reacts to form hydrochloric and sulfuric acids. **Molecular Weight:** 135.0 **Vapour Pressure:** 99.8 mm Hg (18°C). **Boiling Point:** 69.1°C.	**Floatability (Water):** Sinks and reacts to form hydrochloric and sulfuric acids. **Odour:** Acrid, choking. **Flash Point:** Not flammable. **Vapour Density:** 4.6 **Specific Gravity:** 1.67 (20°C).	**Colour:** Colourless to yellow. **Explosive Limits:** Not flammable. **Melting Point:** -54.1°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: sore throat, shortness of breath, laboured breathing. Ingestion: severe burns, abdominal pain. Contact: skin - burns, inflammation; eyes-burns, blurred vision, inflammation.
Toxicology: Highly toxic by all routes.

TLV® (as SO_2) 2 ppm, 5 mg/m^3; (as Cl) 1 ppm, 3 mg/m^3. Short-term Inhalation Limits - No information.	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - No information.

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used, except water. Contact with water may produce a violent reaction with production of hydrochloric and sulfuric acids. Water may be used to cool fire-exposed containers.
Behaviour in Fire: When heated to decomposition emits highly toxic SO_x and chloride fumes.

Ignition Temperature: Not cumbustible.	**Burning Rate:** Not combustible.

Reactivity

With Water: Reacts to produce hydrochloric and sulfuric acids. Reaction may be violent.
With Common Materials: Reacts violently with lead dioxide.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating = 10 to 100 ppm/96 h/TLm/freshwater.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning "CORROSIVE". Avoid contact and inhalation. Call manufacturer or supplier. Dike to contain material. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used on fires involving sulfuryl chloride, except water. Contact with water may produce a violent reaction with production of hydrochloric and sulfuric acids. Water may be used to cool fire-exposed containers. When heated to decomposition, emits highly toxic SO_x and chloride fumes.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes -irrigate with water. Ingestion: give water to conscious victim to drink. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

TALL OIL

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
TALLOL LIQUID ROSIN (A mixture of rosin and fatty acids produced from wood pulp.)	Yellow to brown liquids. Acrid odour.	Hercules Canada, Burlington, Ontario. B.C. Chemical, Prince George, B.C. Great Lakes Forest Products, Thunder Bay, Ontario. Boise Cascade, Fort Frances, Ontario. Prince Albert Pulp, Prince Albert, Saskatchewan.

Transportation and Storage Information

Shipping State: Liquid. **Classification:** None. **Inert Atmosphere:** No requirement. **Venting:** Open (flame arrester). **Pump Type:** Most types.	**Label(s):** Not regulated. **Storage Temperature:** Ambient. **Hose Type:** Most types.	**Grades or Purity:** Crude, refined. **Containers and Materials:** Drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility (Water):** Insoluble. **Molecular Weight:** Variable. **Vapour Pressure:** No information. **Boiling Point:** High.	**Floatability (Water):** Floats. **Odour:** Acrid. **Flash Point:** 182°C (c.c.) **Vapour Density:** No information. **Specific Gravity:** 0.95 to 0.99 (20°C).	**Colour:** Yellow to brown. **Explosive Limits:** No information. **Melting Point:** Variable.

HAZARD DATA

Human Health

Symptoms: Inhalation: dizziness, rapid shallow breathing, respiratory tract irritation. Ingestion: nausea, vomiting, diarrhea, shallow respiration, unconsciousness. Contact: skin - irritation; eyes - irritation.
Toxicology: Low toxicity by all routes.

TLV® No information. Short-term Inhalation Limits - No information.	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - No information.

Fire

Fire Extinguishing Agents: Foam, dry chemical or carbon dioxide, water may be ineffective but may be used to cool fire-exposed containers.
Behaviour in Fire: No information.

Ignition Temperature: No information.	**Burning Rate:** No information.

Reactivity

With Water: No reaction.
With Common Materials: Can react with oxidizing agents.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

COMBUSTIBLE.

Immediate Responses

Keep non-involved people away from spill site. Notify manufacturer or supplier. Dike to contain material. Stop or reduce discharge if safe to do so. Notify environmental authorities.

Protective Clothing and Equipment

Outer protective clothing as required.

Fire and Explosion

Use foam, dry chemical or carbon dioxide to extinguish. Water may be ineffective, but may be used to cool fire-exposed containers.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Ingestion: if breathing has stopped give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give plenty of water to conscious victim to drink and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmetal authorities required).

TEREPHTHALIC ACID $C_6H_4(COOH)_2$

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
1,4-BENZENEDICARBOXYL ACID p-BENZENEDICARBOXYLIC ACID TPA p-PHTHALIC ACID	White crystals or powder. Slight acidic odour.	No Canadian manufacturers Canadian supplier: Millhaven Fibres, Millhaven, Ontario. Originating from: Amoco, USA

Transportation and Storage Information		
Shipping State: Solid. **Classification:** None. **Inert Atmosphere:** No requirement. **Venting:** Open.	**Label(s):** Not regulated. **Storage Temperature:** Ambient.	**Grades or Purity:** Commercial, fibre. **Containers and Materials:** Bags, barrels, bulk, truck, carlots.

Physical and Chemical Characteristics		
Physical State (20°C, 1 atm): Solid. **Solubility** (Water): 0.002 g/100 mL (25°C). **Molecular Weight:** 166.1 **Vapour Pressure:** 0.5 mm Hg (120°C). **Boiling Point:** Sublimes >300°C.	**Floatability** (Water): Sinks. **Odour:** Slight acidic. **Flash Point:** 260°C (o.c.). **Vapour Density:** 5.74 (21°C). **Specific Gravity:** 1.5 (20°C).	**Colour:** White. **Explosive Limits:** (dust) 0.05 g/L (LEL). **Melting Point:** Sublimes >300°C.

HAZARD DATA

Human Health

Symptoms: Contact: skin - slight irritation, redness, pain. Inhalation: of dust or vapours irritating, sore throat, coughing.
Toxicology: Low toxicity by all routes.

TLV® - No information. Short-term Inhalation Limits - No information.	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - Oral: rat = 18.8 g/kg LD_{50} - Intraperitoneal: mouse = 1.43 g/kg

Fire

Fire Extinguishing Agents: Use dry chemical or carbon dioxide. Water or foam may cause frothing.
Behaviour in Fire: No information.
Ignition Temperature: 496°C. **Burning Rate:** No information.

Reactivity

With Water: No reaction.
With Common Materials: May react with oxidizing agents.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways.
Land-Air: Decomposition by soil microorganisms in 2 days.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

COMBUSTIBLE.

Immediate Responses

Keep non-involved people away from spill site. If burning, call Fire Department. Avoid contact and inhalation. Contact manufacturer. Contact environmental authorities.

Protective Clothing and Equipment

Safety goggles - tight fitting. Rubber gloves. Protective clothing as required.

Fire and Explosion

Extinguish fire with dry chemical or carbon dioxide. Water or foam may cause frothing.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: eyes - flush with water; skin - remove contaminated clothing and flush affected areas with water. Inhalation: move to fresh air. Ingestion: give water to conscious victim to drink. Transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

TERPHENYLS $(C_6H_5)_2C_6H_4$(o,m,p)

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
DIPHENYLBENZENE BENZENE-DIPHENYL	Colourless or light yellow solids. Odourless.	No Canadian manufacturers.
Transportation and Storage Information		
Shipping State: Solid. **Classification:** None. **Inert Atmosphere:** No requirement. **Venting:** Open.	**Label(s):** Not regulated. **Storage Temperature:** Ambient.	**Grades or Purity:** Technical. **Containers and Materials:** Bags, drums.
Physical and Chemical Characteristics		
Physical State (20°C, 1 atm): Solid. **Solubility (Water):** Insoluble. **Molecular Weight:** 230.3 **Vapour Pressure:** No information. **Boiling Point:** o, 332°C; m, 365°C; p, 405°C.	**Floatability (Water):** Sinks. **Odour:** Odourless. **Flash Point:** o, 163°C; m, 191°C; p, 207°C (o.c.) **Vapour Density:** 7.95 **Specific Gravity:** o, 1.14; m, 1.16; p, 1.24 (20°C).	**Colour:** Colourless to light yellow. **Explosive Limits:** No information. **Melting Point:** o,58°C; m, 86 to 89°C; p, 213°C.

HAZARD DATA

Human Health		
Symptoms: Contact: eyes and skin - irritating. Ingestion: burning sensation in throat. Inhalation: burning sensation, lung damage. **Toxicology:** Moderately toxic by ingestion or inhalation.		
TLV - 0.05 ppm; 5 mg/m^3. Short-term Inhalation Limits - No information.	LC_{50} - No information. Delayed Toxicity - Possible injury to liver and kidneys.	LD_{50} - No information. LD_{Lo} - Oral: rat = 0.5 g/kg
Fire		
Fire Extinguishing Agents: Use dry chemical or carbon dioxide; water or foam may cause frothing. **Behaviour in Fire:** No information.		
Ignition Temperature? Not available.	**Burning Rate:** No information.	
Reactivity		
With Water: No reaction. **With Common Materials:** Reacts with strong oxidizers. **Stability:** Stable.		
Environment		
Water: Prevent entry into water intakes and waterways. **Land-Air:** No information. **Food Chain Concentration Potential:** No information.		

EMERGENCY MEASURES

Special Hazards

POISONOUS, COMBUSTIBLE.

Immediate Responses

Keep non-involved people away from spill site. If burning, call Fire Department. Avoid contact and inhalation. Contact manufacturer. Contact environmental authorities.

Protective Clothing and Equipment

In fires or enclosed spaces; Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Safety goggles - tight fitting. Rubber gloves. Protective clothing as required.

Fire and Explosion

Use dry chemical or carbon dioxide to extinguish; water or foam may cause frothing.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: eyes - flush with water immediately; skin - flush with water, remove contaminated clothing. Inhalation: give artificial respiration if necessary (not mouth-to-mouth method). Ingestion: do not induce vomiting. If medical assistance is not immediately available, transport victim to doctor, clinic or hospital.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce dischagrge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or or other barrier.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

TETRAETHYL LEAD $(C_2H_5)_4Pb$

IDENTIFICATION

UN No. 1649

Common Synonyms	Observable Characteristics	Manufacturers
MOTOR FUEL ANTIKNOCK COMPOUND TEL TETRAETHYL PLUMBANE TML, TETRAMETHYL LEAD	Liquid, usually containing a coloured dye (red, blue) (colourless in pure state). Sweet, pleasant odour.	Dupont of Canada Ltd., Maitland, Ont. Ethyl Corporation of Canada Ltd., Corunna, Ont.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Poison.
Inert Atmosphere: No requirement.
Venting: Pressure-vacuum.
Pump Type: Most types.

Label(s): White label - POISON; Class 6.1, Group I.
Storage Temperature: Ambient.
Hose Type: Most types.
Containers and Materials: Drums, trailers, tank cars, tank trucks; steel.

Grades or Purity: Technical (98%).
"Ethyl" TML motor mix; tetramethyl lead 50.8%, ethylene dibromide 17.9%, ethylene dichloride 18.8%, toluene 12.2%. "Ethyl" TEL motor mix; tetraethyl lead 61.5%, ethylene dibromide 17.9%, ethylene dichloride 18.8%, kerosene 1.2%. "Ethyl" TEL aviation mix; tetraethyl lead 61.4%, ethylene dibromide 35.7%, kerosene 2.5%.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): Insoluble.
Molecular Weight: 323.4
Vapour Pressure: 0.15 mm Hg (20°C); 1.0 mm Hg (38.4°C) (technical); 7.5 mm Hg (20°C) TEL aviation mix; 35.9 mm Hg (20°C) TEL motor mix; 39.6 mm Hg (20°C) TML motor mix.
Boiling Point: Technical decomposes 198 to 202°C; TEL aviation mix 138°C; TEL motor mix 105°C; TML motor mix 97°C.

Floatability (Water): Sinks.
Odour: Sweet, pleasant.
Flash Point: 85°C (o.c.); 93°C (c.c.) (technical); 32°C (o.c.) (TML); 118°C (o.c.) (TEL motor mix); 121°C (o.c.) (TEL aviation).
Vapour Density: 7 to 11.2 (technical); 4.9 (TML); 3.7 (TEL motor mix); 6.6 (TEL aviation).
Specific Gravity: Technical 1.7; TEL (motor), TML, 1.59; TEL aviation 1.74 (all at 20°C).

Colour: Red, blue or orange depending on dye added.
Explosive Limits: No information.
Melting Point: -137°C (technical).

HAZARD DATA

Human Health

Symptoms: Inhalation and ingestion: restlessness, headache, trembling hands, pale complexion, nausea and vomiting, insomnia and nightmares. Contact: skin - (absorbed) itching, inflammation, blisters; eyes - irritation, watering inflammation. Extreme exposure could be fatal.
Toxicology: Highly toxic by all routes.
TLV® (skin) 0.1 mg/m^3 tetraethyl (as Pb); 0.15 mg/m^3 (tetramethyl).
LC_{50} - Inhalation: rat = 850 mg/m^3 (60 min)
Delayed Toxicity - Lead poisoning.
LD_{50} - Via skin: rat = 0.015 g/kg
LD_{Lo} - Oral: rat = 0.017 g/kg
Short-term Inhalation Limits - 0.3 mg/m^3 tetraethyl 15 min (skin)(as Pb); 0.5 mg/m^3 tetramethyl (as Pb).

Fire

Fire Extinguishing Agents: Use water mist, dry chemical, foam or carbon dioxide to extinguish. Use water to cool fire-exposed containers and disperse vapours.
Behaviour in Fire: Heating to decomposition produces toxic lead vapours. Burning (TEL mixes) in air is only sustained in presence of burning combustibles. TML will undergo self-sustained burning.
Ignition Temperature: Closed containers may explode above 80°C.
Burning Rate: No information.

Reactivity

With Water: No reaction.
With Common Materials: Can react vigorously with oxidizing materials.
Stability: Commercial grades are stable. Technical grade is only stable below 80°C.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 0.2 mg/L/96 h/bluegill/TLm/freshwater; Aquatic toxicity rating = <1 ppm/96 h/TLm/freshwater; 1.4 mg/L/48 h/bluegill/TLm/freshwater: 2 mg/L/24 h/bluegill/TLm/freshwater; BOD: No info...

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "POISON". Call Fire Department. Evacuate area and keep all persons upwind. Avoid contact and inhalation. Notify manufacturer and request assistance. Dike spill area to prevent liquid from entering water intakes, watercourses or sewers. Stop or reduce discharge, if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated protective clothing. Gloves - neoprene, rubber. Boots - high, rubber (pants worn outside boots).

Fire and Explosion

Use water mist, dry chemical, foam or carbon dioxide to extinguish. Use water to cool fire-exposed containers and disperse vapours. Heating to decomposition produces toxic vapours. Burning (TEL mixes) in air is only sustained in presence of burning combustibles. TML will undergo self-sustained burning.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: while removing contamined clothing, immediately flush skin and eyes with plenty of warm water for at least 15 minutes. Speed is of utmost importance. Ingestion: in case of swallowing, vomiting should be induced for conscious victim only, give milk or water to drink. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Remove contaminated soil for disposal.
8. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

TITANIUM DIOXIDE TiO_2

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
TITANIC OXIDE TITANIC ANHYDRIDE TITANIUM WHITE	White powder. Odourless.	NL Chemical Canada, Varennes, Quebec. Tioxide of Canada, Tracy, Quebec.
Transportation and Storage Information		
Shipping State: Solid. **Classification:** Not regulated. **Inert Atmosphere:** No requirement. **Venting:** No requirement.	**Label(s):** Not regulated. **Storage Temperature:** Ambient.	**Grades or Purity:** Technical and pure. **Containers and Materials:** Fibre drums, paper bags; bulk by truck or train.
Physical and Chemical Characteristics		
Physical State (20°C, 1 atm): Solid. **Solubility (Water):** Insoluble. **Molecular Weight:** 79.9 **Vapour Pressure:** No information. **Boiling Point:** 2 500 to 3 000°C.	**Floatability (Water):** Sinks (finely divided powder may trap air and remain floating). **Odour:** Odourless. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** 4.26 (20°C).	**Colour:** White **Explosive Limits:** Not flammable. **Melting Point:** 1 830 to 1 850°C.

HAZARD DATA

Human Health		
Symptoms: Inhalation: coughing (nuisance particle) - eyes, redness. Ingestion: generally nontoxic. **Toxicology:** Relatively nontoxic.		
TLV® (dust) 10 mg/m^3. Short-term Inhalation Limits - 20 mg/m^3 for 15 min (dust).	LC_{50} - No information. Delayed Toxicity - None.	LD_{50} - No information. LD_{Lo} - Intramuscular: rat = 0.3 g/kg
Fire		
Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used in fires involving titanium dioxide. **Behaviour in Fire:** Not combustible. Titanium dioxide is very inert even in a fire. **Ignition Temperature:** Not combustible.	**Burning Rate:** Not combustible.	
Reactivity		
With Water: No reaction. **With Common Materials:** Reacts violently with lithium. **Stability:** Stable.		
Environment		
Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating >1 000 ppm/96 h/TLm/freshwater. **Land-Air:** No information. **Food Chain Concentration Potential:** No information.		

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Notify manufacturer. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - dust respirators should be worn if required; otherwise, goggles and protective clothing as required.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used on fires containing titanium dioxide.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: remove victim to fresh air, allow to rest. Contact: eyes or skin - rinse with plenty of water; remove contaminated clothing. Ingestion: give water to conscious victim to drink. If necessary, transport victim to doctor, clinic or hospital.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Remove material by manual or mechanical means.
4. Recover undamaged containers.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Can be placed in a landfill site (approval of environmental authorities required).

TOLUENE $C_6H_5CH_3$

IDENTIFICATION

UN No. 1294

Common Synonyms	Observable Characteristics	Manufacturers
TOLUOL METHYLBENZENE METHYLBENZOL PHENYLMETHANE	Clear, colourless liquid. Aromatic odour.	Finachem Canada, Montreal, Quebec. Sunchem, Sarnia, Ontario. Esso Chemical Canada, Sarnia, Ontario. Shell Canada, Corunna, Ontario. Dow Chemical Canada Inc., Sarnia, Ont.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable.
Inert Atmosphere: No requirement.
Venting: Open (flame arrester) or pressure-vacuum.
Pump Type: Gear, centrifugal; steel, all - iron, stainless steel.

Label(s): Red label - FLAMMABLE LIQUID; Class 3.2, Group II.
Storage Temperature: Ambient.
Hose Type: Polyethylene, Viton, butyl, flexible stainless steel.

Grades or Purity: Industrial, 94+%, nitration, 99.8+%.
Containers and Materials: Drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 0.047 g/100 mL (16°C); 0.087 g/100 mL (20°C).
Molecular Weight: 92.2
Vapour Pressure: 10 mm Hg (6.4°C); 22 mm Hg (20°C); 36.7 mm Hg (30°C); 40 mm Hg (31.8°C).
Boiling Point: 110.6°C.

Floatability (Water): Floats.
Odour: Aromatic (0.17 to 40 ppm, odour threshold).
Flash Point: 12.8°C (o.c.); 4°C (c.c.).
Vapour Density: 3.1
Specific Gravity: 0.87 (20°C).

Colour: Colourless.
Explosive Limits: 1.2 to 7.1%.
Melting Point: -95°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: Headache, nausea, loss of appetite, rapidly developing pulmonary edema. Ingestion: vomiting, nausea, irritability, central nervous system depression, depression of bone marrow, depressed respiration. Contact: eyes - irritation; skin - may be absorbed.
Toxicology: Moderately toxic by ingestion and inhalation. Moderately toxic by contact.

TLV® - (skin) 100 ppm; 375 mg/m^3.
Short-term Inhalation Limits - (skin) 150 ppm; 560 mg/m^3.

LC_{50} - Inhalation: mouse = 5 320 ppm/8 h
LC_{Lo} - Inhalation: rat = 4 000 ppm/4 h
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 5 g/kg
LD_{50} - skin: rabbit = 14 g/kg

Fire

Fire Extinguishing Agents: Use carbon dioxide, dry chemical or foam. Water may be ineffective but may be used to cool fire-exposed containers.
Behaviour in Fire: Flashback may occur along vapour trail.
Ignition Temperature: 480°C.
Burning Rate: 5.7 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Can react vigorously with oxidizing materials. Reacts violently with (nitric and sulfuric acids), nitrogen tetroxide and silver perchlorite.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating: 10 to 100 ppm/96 h/TLm/freshwater; Fish toxicity: 1 180 mg/L/96 h/sunfish/TLm/freshwater; 24 mg/L/24 h/bluegill/TLm/freshwater; 1 340 mg/L/24 h/mosquito fish/TLm/freshwater; BOD: 86%, 5 days.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all ignition sources. Call manufacturer or supplier for advice. Avoid contact and inhalation. Contain spill by diking. Prevent entry into water intakes and sewers. Stop or reduce discharge if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - In fires or enclosed spaces, self-contained breathing apparatus; otherwise, chemical goggles - (mono), tight fitting. Face shield must not replace goggles. Gloves - rubber. Boots - rubber, high (pants worn outside boots). Outer protective clothing as required. Totally encapsulated protective clothing in fires or enclosed spaces.

Fire and Explosion

Use dry chemical, carbon dioxide or alcohol foam. Water may be ineffective, but may be used to cool fire-exposed containers. Flash back may occur along vapour trail.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: skin and eyes - wash affected parts with soap and water. Flush eyes with copious quantities of water for at least 15 minutes. Ingestion: do not induce vomiting. Give water or milk to conscious victim. Inhalation: if breathing has stopped, give artificial respiration. If breathing is laboured, give oxygen. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Can be taken to chemical incinerator (approval of environmental authorities required).

TOLUENE DIISOCYANATE $1\text{-}CH_3C_6H_3(NCO)_2\text{-}2,4$

IDENTIFICATION

UN No. 2078

Common Synonyms

2,4-TOLULENE DIISOCYANATE
DI-ISO-CYANATOLUENE
2,4-TOLYLENE DIISOCYANATE
META-TOLYLENE DIISOCYANATE
TOLUENE 2,4-DIISOCYANATE
ISOCYANIC ACID, METHYLPHENYLINE ESTER
2,4 - TDI
VORANATE T-80™

Observable Characteristics

Water white to pale yellow liquid with sharp, pungent odour.

Manufacturers

No Canadian Manufacturers.
Canadian Suppliers:
BASF Canada, Montreal, Que.
Dow Chemical Canada Inc.
Mobay Canada, Toronto
Olin Chemical Canada

Originating from:
BASF Wyandotte, USA
Dow Chemical, USA, Freeport, TX.
Mobay USA, Pittsburgh.
Olin, USA, Lake Charles LA.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Poisonous liquid.
Inert Atmosphere: Inerted.
Venting: Pressure-vacuum.
Pump Type: Centrifugal or positive displacement; steel or stainless steel.

Label(s): White label - POISONOUS LIQUID; Class 6.1; Groups I or II.
Storage Temperature: Ambient.
Hose Type: Seamless stainless steel, Teflon, Viton.

Grades or Purity: Commercial, 2,4-TDI 99%; 2,4-TDI 80% and 20% 2,6-TDI; 2,4-TDI 65% and 35% 2,6-TDI.
Containers and Materials: Drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State Liquid.
Solubility (Water): Reacts producing CO_2 and other products.
Molecular Weight: 174.2
Vapour Pressure: 0.01 mm Hg (20°C); 1 mm Hg (80°C).
Boiling Point: 251°C.

Floatability (Water): Sinks and reacts.
Odour: Sharp pungent (0.4 to 2.4 ppm, odour threshold).
Flash Point: 132°C (o.c.).
Vapour Density: 6.0
Specific Gravity: 1.22 at 25°C.

Colour: Water white to pale yellow.
Explosive Limits: 0.9 to 9.5%.
Melting Point: 20 to 22°C.
80/20 14°C (freezing point).

HAZARD DATA

Human Health

Symptoms: Inhalation: Potent sensitizer and lung irritant if inhaled. May produce bronchospasm (asthma), pneumonitis, bronchitis and pulmonary edema. Nocturnal cough and shortness of breath. Contact: skin - irritation; eyes - severe irritation. Ingestion: corrosive to digestive tract causing severe irritation, nausea, vomiting and diarrhea.
Toxicology: Highly toxic by inhalation, moderately toxic by ingestion.
TLV®- 0.005 ppm, 0.04 mg/m^3
Short-term Inhalation Limits - 0.02 ppm, 0.15 mg/m^3 for 15 min.

LC_{50} - Inhalation: mouse = 10 ppm/4 h
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 5.8 g/kg

Fire

Fire Extinguishing Agents: Use water spray, dry chemical or carbon dioxide. Water or foam may cause frothing. Cool exposed tanks with water.
Behaviour in Fire: When heated to decomposition, emits highly toxic fumes.
Ignition Temperature: No information.
Burning Rate: No information.

Reactivity

With Water: Reacts violently to form carbon dioxide gas and other products.
With Common Materials: Reacts with acids, amines, bases and alcohols. May react with metals and compounds of copper, tin and mercury.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating = 1 to 10 ppm/96 h/TLm/freshwater.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "POISON". Call Fire Department. Keep upwind. Avoid contact and inhalation. Evacuate from downwind. Dike to prevent runoff. Call manufacturer or supplier. Call environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated suit.

Fire and Explosion

Use water spray, dry chemical or carbon dioxide to extinguish. Water or foam may cause frothing. When heated to decomposition, emits highly toxic fumes.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water for at least 15 minutes; eyes - irrigate with water; Ingestion: give water to conscious victim to drink. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water	Land-Air
1. Stop or reduce discharge if safe to do so. 2. Contact manufacturer or supplier for advice. 3. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.	1. Stop or reduce discharge if safe to do so. 2. Contact manufacturer or supplier for advice. 3. Contain spill by diking with earth or other barrier. 4. Remove material with pumps or vacuum equipment and place in appropriate containers (caution: avoid contact and inhalation). 5. Recover undamaged containers. 6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

TRIALLATE $C_{10}H_{16}Cl_3NOS$

IDENTIFICATION

UN No. 2761
Danger Group According to Percentage of Active Substance: Group III, Liquid 30 to 100%

Common Synonyms	Observable Characteristics	Manufacturers
S-2,3,3-TRICHLOROALLYL DIISOPROPYLTHIOCARBAMATE	Light brown liquid or grey-brown solid.	Monsanto Company, Winnipeg, Manitoba
Common Trade Names AVADEX		
(A herbicide used for pre- or post-emergent control of wild oats).		

Transportation and Storage Information		
Shipping State: Solid or liquid (formulation). **Classification:** None. **Inert Atmosphere:** No requirement. **Venting:** Open. **Pump Type:** No information.	**Label(s):** Not regulated. **Storage Temperature:** Ambient. **Hose Type:** No information.	**Grades or Purity:** Various, as shown below. **Containers and Materials:** Glass bottles; cans, drums; steel.

Physical and Chemical Characteristics		
Physical State (20°C, 1 atm): Solid (technical). **Solubility (Water):** 0.0004 g/100 mL (25°C); EC is dispersible in water. **Molecular Weight:** 304.7 **Vapour Pressure:** 0.00012 mm Hg (25°C) (technical). **Boiling Point:** 136°C (at 1 mm Hg) (technical) (decomposes >200°C).	**Floatability (Water):** Sinks; EC mixes. **Odour:** No information. **Flash Point:** 95°C (o.c.). **Vapour Density:** No information. **Specific Gravity:** 1.27 (25°C) technical.	**Colour:** Liquid-light brown; Solid-grey brown. **Explosive Limits:** Not flammable. **Melting Point:** 29 to 30°C (technical).

HAZARD DATA

Human Health		
Symptoms: Ingestion: CNS depression, headache and rash. **Toxicology:** Low toxicity by all routes.		
TLV® - No information. Short-term Inhalation Limits - No information.	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - Oral: rat = 1.47 g/kg LD_{50} - Skin: rabbit = 2.23 g/kg

Fire	
Fire Extinguishing Agents: Foam, carbon dioxide or dry chemical. **Behaviour in Fire:** Releases toxic fumes.	
Ignition Temperature: No information.	**Burning Rate:** No information.

Reactivity

With Water: No reaction.
With Common Materials: No information.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicities: 9.6 ppm/96 h/rainbow trout/TLm/freshwater; 4.9 ppm/96 h/bluegill/TLm/freshwater.
Land-Air: LD_{50} - Oral: Duck = >5000 ppm. LC_{50} - Oral: Quail = >5000 ppm.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Stop or reduce discharge if safe to do so. Notify manufacturer or supplier. Dike to contain material or water runoff. Notify environmental authorities.

Protective Clothing and Equipment

In fires or confined spaces - Respiratory protection - self-contained breathing apparatus and totally encapsulated suit. Otherwise, approved pesticide respirator and impervious outer clothing.

Fire and Explosion

Use carbon dioxide, foam or dry chemical to extinguish. Releases toxic fumes in fires.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give water to conscious victim to drink and induce vomiting; in the case of petroleum distillates, do not induce vomiting for fear of aspiration and chemical pneumonia. If medical assistance is not immediately available, transport victim to hospital, doctor, or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.

Floats

3. If possible contain discharge by booming.
4. If floating, skim and remove.

Sinks or mixes

3. If possible contain discharge by damming or water diversions.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.

5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. If liquid, remove material with pumps or vacuum equipment and place in appropriate containers.
5. If solid, remove material by manual or mechanical means.
6. Recover undamaged containers.
7. Absorb residual liquid on natural or synthetic sorbents.
8. Remove contaminated soil for disposal.
9. Notify environmental authorities to discuss cleanup and disposal of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

Available Formulations

Technical Grade: Purity: 90+%.
Properties: Combustible, insoluble in water.

Formulations:

Type:	Purity:	Properties:
EC - emulsifiable concentrate	- typically 35%	- dispersible in water
GR - granular	- typically 10% in inerts (clay)	

TRICHLORFON $(CH_3O)_2P(O)CH(OH)CCl_3$

IDENTIFICATION

UN No. 2783
Danger Group According to Percentage of Active Substance: Group III, Solid 2 to 20%
Liquid 0.5 to 20%

Common Synonyms
2,2,2-TRICHLORO-1-HYDROXYETHYL-PHOSPHONATE
TRICHLORPHON

Common Trade Names
DYLOX, DUTOX
(An insecticide used for the control of a variety of pests.)

Observable Characteristics
White or brownish powder or liquid.

Manufacturers
Interprovincial Co-ops Ltd., Saskatoon, Sask.
Chemagro Ltd., Mississauga, Ontario.
Chipman Inc., Stoney Creek, Ontario.
Les produits Marquette, Longueuil, Québec.

Transportation and Storage Information

Shipping State: Solid or liquid (formulation).
Classification: None.
Inert Atmosphere: No requirement.
Venting: Open.
Pump Type: No information.

Label(s): Not regulated.
Storage Temperature: Ambient.
Hose Type: No information.

Grades or Purity: Various, as described below.
Containers and Materials: Glass bottles; cans, drums; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid (technical).
Solubility (Water): 15.4 g/100 mL (25°C) technical; EC is dispersible in water, SN and SP are soluble.
Molecular Weight: 257.4
Vapour Pressure: 0.0000078 mm Hg (20°C) technical.
Boiling Point: 100°C (0.1 mm Hg) technical.

Floatability (Water): Sink and mix.
Odour: No information.
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: 1.73 (20°C) technical.

Colour: White or brownish.
Explosive Limits: Not flammable.
Melting Point: 83 to 84°C (technical).

HAZARD DATA

Human Health

Symptoms: Inhalation, Skin Absorption or Ingestion: nausea, salivation, tearing, abdominal cramps, vomiting, sweating, muscular tremors, cyanosis.
Toxicology: Highly toxic by ingestion. Moderately toxic by inhalation and skin contact.
TLV® No information.
Short-term Inhalation Limits - No information.

LC_{50} - Inhalation: rat = 1.3 mg/m^3
Delayed Toxicity - Suspected mutagen.

LD_{50} - Oral: rat = 0.45 g/kg
LD_{50} - Skin contact rat = 0.40 g/kg

Fire

Fire Extinguishing Agents: Use foam, carbon dioxide or dry chemical.
Behaviour in Fire: Releases toxic fumes.
Ignition Temperature: No information.
Burning Rate: No information.

Reactivity

With Water: May hydrolyse to dichlorovos in alkaline conditions.
With Common Materials: Decomposes to dichlorvos in alkaline solutions.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicities: 0.0081 mg/L/48 h/*Daphnia magna*/LC_{50}/freshwater; 1.2 to 2.4 mg/L/96 h/rainbow trout/LC_{50}/freshwater; 6.7 to 9.2 mg/L/96 h/fathead minnow/LC_{50}/freshwater; 2.6 to 3.7 mg/L/96 h/bluegill/LC_{50}/freshwater.
Land-Air: LD_{50} - Oral: Chicken = 0.125 g/kg; Oral: Wild bird = 0.04 g/kg
Food Chain Concentration Potential: Suspected to convert to more toxic dichlorvos.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Stop or reduce discharge if safe to do so. Notify manufacturer or supplier. Dike to contain material or water runoff. Notify environmental authorities.

Protective Clothing and Equipment

In fires or confined spaces - Respiratory Protection - self-contained breathing apparatus and totally encapsulated suit. Otherwise, approved pesticide respirator and impervious outer clothing.

Fire and Explosion

Use carbon dioxide, foam or dry chemical to extinguish. Releases toxic fumes in fires.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give water to conscious victim and induce vomiting; in the case of petroleum distillates, do not induce vomiting for fear of aspiration and chemical pneumonia. If medical assistance is not immediately available, transport victim to hospital, doctor, or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.

Floats

3. If possible contain discharge by booming.
4. If floating, skim and remove.

Sinks or mixes

3. If possible contain discharge by damming or water diversions.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.

5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. If liquid, remove material with pumps or vacuum equipment and place in appropriate containers.
5. If solid, remove material by manual or mechanical means.
6. Recover undamaged containers.
7. Absorb residual liquid on natural or synthetic sorbents.
8. Remove contaminated soil for disposal.
9. Notify environmental authorities to discuss cleanup and disposal of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

Available Formulations

Technical Grade: Purity: 90+%.
Properties: moderately soluble in water, combustible.

Formulations:

Type:	Purity:	Properties:
EC - emulsifiable concentrate	- typically 80%	- dispersible in water
SN - solution	- typically 85%	- miscible in water
SP - soluble powder	- typically 80%	- miscible in water
GR - granular	- typically 5%, remainder is inert	

Other Possible Ingredients Found in Formulations: dichlorvos, oxydemeton methyl.

TRICHLORFON $(CH_3O)_2P(O)CH(OH)CCl_3$

1,1,1-TRICHLOROETHANE CH_3CCl_3

IDENTIFICATION

UN No. 2831

Common Synonyms	Observable Characteristics	Manufacturers
TRICHLORETHANE METHYLCHLOROFORM CHLOROTHENE AEROTHENE	Colourless, liquid with a sweetish odour.	Dow Chemical Canada, Inc., Sarnia, Ontario.

Transportation and Storage Information

Shipping State: Liquid. **Classification:** Poisonous liquid. **Inert Atmosphere:** No requirement. **Venting:** Pressure-vacuum **Pump Type:** Steel, stainless steel (not aluminum); centrifugal or positive displacement.	**Label(s):** White label - POISONOUS LIQUID; Class 6.1, Group III. **Storage Temperature:** Ambient. **Hose Type:** Seamless stainless steel, Teflon (not natural rubber).	**Grades or Purity:** Commercial and technical. **Containers and Materials:** Drums and tanks cars; steel (not aluminum).

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid. **Solubility (Water):** 0.44 g/100 mL (20°C). **Molecular Weight:** 133.4 **Vapour Pressure:** 100 mm Hg (20°C); 127 mm Hg (25°C); 155 mm Hg (30°C). **Boiling Point:** 74.1°C.	**Floatability (Water):** Sinks. **Odour:** Sweetish; 100 to 700 ppm, odour threshold. **Flash Point:** Not flammable under ordinary temperatures and pressures. **Vapour Density:** 4.6 **Specific Gravity:** 1.34 at 20°C.	**Colour:** Colourless. **Explosive Limits** 8 to 10.5% (at elevated temperatures). **Melting Point:** -30 to -33°C.

HAZARD DATA

Human Health

Symptoms: Contact: skin - irritation and dermatitis; eyes - pain and irritation. Inhalation or ingestion: dizziness, nausea, fainting, unconsciousness and respiratory depression.
Toxicology: Moderately toxic by ingestion.

TLV® - 350 ppm; 1 900 mg/m^3. Short-term Inhalation Limits - 450 ppm; 2 450 mg/m^3 (15 min).	LC_{50} - No information. LC_{Lo} - Inhalation: man = 4 900 ppm/10 min. Delayed Toxicity - No information.	LD_{50} - Oral: rat = 10.3 g/kg LD_{50} - Oral: mouse = 11.2 g/kg

Fire

Fire Extinguishing Agents: Use dry chemical, foam or carbon dioxide. Water may be used to cool fire-exposed containers.
Behaviour in Fire: Toxic and irritating gases are generated in fires (Cl_2, HCl, phosgene, etc.).
Ignition Temperature: 537°C. **Burning Rate:** 2.9 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Reacts violently with acetone, oxygen, sodium metal and sodium hydroxide.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Hazardous to aquatic life. Fish toxicity: 75 to 150 ppm/tns/pinfish/TLm/saltwater; Aquatic toxicity rating = 10 to 100 ppm/96 h/TLm/freshwater.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "POISON". Call Fire Department. Avoid contact and inhalation. Dike to prevent runoff of material. Contact manufacturer. Contact environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus and totally encapsulated protective clothing.

Fire and Explosion

Use dry chemical, foam or carbon dioxide to extinguish fires. Use water to keep fire-exposed containers cool. Toxic and irritating gases (Cl_2, HCl, phosgene) are generated in fires.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: skin - remove contaminated clothing and wash affected area with soap and water; eyes - irrigate with water. Inhalation: give artificial respiration if necessary. Ingestion: give water to drink; do not induce vomiting. Transport to hospital; advise doctor not to give adrenalin or other stimulants.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Adsorb residual liquid on natural or synthetic sorbents.
7. Remove contaminated soil for disposal.
8. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

TRIFLURALIN $F_3C(NO_2)_2C_6H_2N(C_3H_7)_2$

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
α,α,α-TRIFLUORO-2,6-DINITRO-N, N-DIPROPYL-p-TOLUIDINE **Common Trade Names** TREFLAN (A herbicide used for the pre-emergent control of grasses and broadleaf plants.)	Orange or brown solid, brown liquid. Slight odour.	Interprovincial Co-ops Ltd., Saskatoon, Sask. Eli Lilly and Co. (Canada Ltd.), Toronto, Ontario. Chevron Chemical (Canada Ltd.), Burlington, Ontario. Saskatchewan Wheat Pool, Regina, Saskatchewan.

Transportation and Storage Information

Shipping State: Solid or liquid (formulation). **Classification:** None. **Inert Atmosphere:** No requirement. **Venting:** Open. **Pump Type:** No information.	**Label(s):** Not regulated. **Storage Temperature:** Ambient. **Hose Type:** No information.	**Grades or Purity:** Various as described below. **Containers and Materials:** Glass bottles; cans, drums; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid (technical). **Solubility** (Water): 0.0001 g/100 mL (technical); EC is dispersible. **Molecular Weight:** 335 **Vapour Pressure:** 0.0002 (30°C) technical. **Boiling Point:** 139-149°C (at mm Hg) technical.	**Floatability** (Water): Sinks, EC is dispersible. **Odour:** Slight. **Flash Point:** EC may be flammable. **Vapour Density:** No information. **Specific Gravity:** 1.29 (25°C) technical.	**Colour:** Orange to brown. **Explosive Limits:** EC may be flammable. **Melting Point:** 49°C (technical).

HAZARD DATA

Human Health

Symptoms: Inhalation: respiratory tract irritation, convulsions, coma; Contact: skin - irritation. Ingestion: irritation of gastrointestinal tract.
Toxicology: Moderate toxicity by all routes.

TLV® No information. Short-term Inhalation Limits - No information.	LC_{50} - No information. Delayed Toxicity - Suspected carcinogen.	LD_{50} - Oral: mouse = 5.0 g/kg

Fire

Fire Extinguishing Agents: Use foam, carbon dioxide or dry chemical.
Behaviour in Fire: Releases toxic fumes.

Ignition Temperature: No information.	**Burning Rate:** No information.

Reactivity

With Water: No reaction.
With Common Materials: No information.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 0.026 to 0.062 mg/L/96 h/rainbow trout/LC_{50}/freshwater; 0.083 to 0.134mg/L/96 h/fathead minnow/LC_{50}/freshwater; 0.047 to 0.070 mg/L/96 h/bluegill/LC_{50}/freshwater; 0.320 to 1.0 mg/L/96 h/Daphnia magna/LC_{50}/freshwater.
Land-Air: LD_{50} - Oral: Chicken = 72.0 g/kg; (no effect level).
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Stop or reduce discharge if safe to do so. Notify manufacturer or supplier. Dike to contain material or water runoff. Notify environmental authorities.

Protective Clothing and Equipment

In fires or confined spaces - Respiratory Protection - self-contained breathing apparatus and totally encapsulated suit. Otherwise, approved pesticide respirator and impervious outer clothing.

Fire and Explosion

Use carbon dioxide, foam or dry chemical to extinguish. Releases toxic fumes in fires.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration (not mouth-to-mouth method); if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give water to conscious victim to drink and induce vomiting; in the case of petroleum distillates, do not induce vomiting for fear of aspiration and chemical pneumonia. If medical assistance is not immediately available, transport victim to hospital, doctor, or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.

Floats

3. If possible contain discharge by booming.
4. If floating, skim and remove.

Sinks or mixes

3. If possible contain discharge by damming or water diversions.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.

5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. If liquid, remove material with pumps or vacuum equipment and place in appropriate containers.
5. If solid, remove material by manual or mechanical means.
6. Recover undamaged containers.
7. Absorb residual liquid on natural or synthetic sorbents.
8. Remove contaminated soil for disposal.
9. Notify environmental authorities to discuss cleanup and disposal of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

Available Formulations

Technical Grade: Purity: 95+%.
Properties: combustible, insoluble in water.

Formulations:

Type:	Purity:	Properties:
EC - emulsifiable concentrate	- typically 35% remainder aromatic petroleum distillates	- dispersible in water, combustible and possible flammable.
GR - granular	- typically 5%	- combustible

TRINITROTOLUENE $C_6H_2(CH_3)(NO_2)_3$

IDENTIFICATION

UN No. 0209 dry
1356 wetted (containing 10% water)

Common Synonyms	Observable Characteristics	Manufacturers
METHYLTRINITROBENZENE TNT	Pale yellow crystals or flakes. Wet is a yellow slurry or sludge. Odourless.	Canadian Industries Ltd., Montreal, Quebec.

Transportation and Storage Information

Shipping State: Solid.
Classification: Explosive.
Inert Atmosphere: No requirement.
Venting: Open.
Label(s): Orange and black label - EXPLOSIVE; Class 1.1.D.
Storage Temperature: Ambient.
Grades or Purity: Technical.
Containers and Materials: Wooden cases or kegs.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): 0.02 g/100 mL (15°C); 0.07 g/100 mL (100°C).
Molecular Weight: 227.1
Vapour Pressure: 0.043 mm Hg (81°C).
Boiling Point: Explodes at 240°C.
Floatability (Water): Sinks.
Odour: Odourless.
Flash Point: Explodes.
Vapour Density: No information.
Specific Gravity: 1.65 (20°C).
Colour: Pale yellow.
Explosive Limits: Explodes if vigorously shocked or heated to 240°C.
Melting Point: 81°C.

HAZARD DATA

Human Health

Symptoms: Inhalation, Skin absorption, or Ingestion: jaundice, dermatis, cyanosis pallour, loss of appetite, nausea.
Toxicology: Moderately toxic by ingestion and contact.
TLV® (skin) 0.5 mg/m^3.
Short-term Inhalation Limits - (skin) 3 mg/m^3 (15 min).
LC_{50} - No information.
Delayed Toxicity - Damage to liver, bones and kidneys.
LD_{50} - No information.
LD_{Lo} - Oral: rat = 0.7 g/kg

Fire

Fire Extinguishing Agents: Fight fires from explosive-resistant location. Use water to cool fire-exposed containers.
Behaviour in Fire: Will explode. In explosion releases toxic NO_x fumes.
Ignition Temperature: Explodes 240°C.
Detonation velocity: (6 900 m/s).

Reactivity

With Water: No reaction.
With Common Materials: Can react vigorously with reducing materials.
Stability: Strong shock or elevated temperature (240°C) will detonate TNT.

Environment

Water: Prevent entry into water intakes and waterways. Toxic to aquatic life.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

EXPLOSIVE. Can detonate at 240°C or with shock.

Immediate Responses

Keep non-involved people away from spill site and evacuate people to a safe distance as soon as possible. Issue warning "EXPLOSIVE". CALL FIRE DEPARTMENT. Enforce strict evacuation of area. Contact manufacturer. Contact environmental authorities.

Protective Clothing and Equipment

Respiratory protection - after explosion has occured, self-contained breathing apparatus; otherwise, face shield rubber gloves, boots and protective clothing as required.

Fire and Explosion

Explosive, fight fires from explosive-resistant location. Use water spray to cool fire-exposed containers.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: eyes - irrigate immediately; skin - wash with soapy water immediately. Ingestion: give water to drink and induce vomiting. If medical assistancce is not immediately available, transport victim to doctor, hospital or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Evacuate area and control spill from an an explosion resistant location.
2. Stop or reduce discharge if safe to do so.
3. Contact manufacturer or supplier for advice.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Evacuate area and control spill from an explosion resistant location.
2. Stop or reduce discharge if safe to do so.
3. Contact manufacturer or supplier for advice.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

TURPENTINE $C_{10}H_{16}$ (primarily)

IDENTIFICATION

UN No. 1299

Common Synonyms	Observable Characteristics	Manufacturers
SPIRITS OF TURPENTINE TURPS GUM TURPENTINE WOOD TURPENTINE GUMTHUS Mixture of several compounds, principally pinene, diterpene.	Colourless liquid, with penetrating, unpleasant odour.	Record Chemical, Napierville, Quebec.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable liquid.
Inert Atmosphere: No requirement.
Venting: Open (flame arrester).
Pump Type: Steel, stainless steel.

Label(s): Red label - FLAMMABLE LIQUID; Class 3.2, Group III.
Storage Temperature: Ambient.
Hose Type: Most types (except rubber).

Grades or Purity: Variety.
Containers and Materials: Bottles, cans, drums, tank cars and trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): Insoluble.
Molecular Weight: Variable, 136 (average).
Vapour Pressure: 5 mm Hg (25°C).
Boiling Point: 154 to 170°C.

Floatability (Water): Floats.
Odour: Aromatic, penetrating, unpleasant.
Flash Point: 35°C (c.c.).
Vapour Density: 4.8
Specific Gravity: 0.85 to 0.88 (15°C).

Colour: Colourless.
Explosive Limits: 0.8% (LEL).
Melting Point: -55°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: vapour causes headache, confusion, respiratory distress. If liquid is taken into lungs, causes severe pneumonitis. Contact: skin - irritation. Ingestion: irritates entire digestive system and may injure kidneys.
Toxicology: Highly toxic by inhalation.
TLV® (skin) 100 ppm; 560 mg/m^3.
Short-term Inhalation Limits - 150 ppm; 840 mg/m^3 (15 min).

LC_{50} - No information.
TC_{Lo} - Inhalation: human = 175 ppm

LD_{50} - Oral: rat = 5.8 g/kg
LD_{50} - Inhalation: mouse = 0.06 g/kg

Fire

Fire Extinguishing Agents: Use foam, dry chemical or carbon dioxide. Water may be ineffective, but should be used to keep fire-exposed containers cool.
Behaviour in Fire: Releases acrid fumes in fire.
Ignition Temperature: 253°C.
Burning Rate: 2.4 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Can react with oxidizers. Reacts violently with calcium hypochlorite, chlorine, chromic anhydride, hexachloromelamine, stannic chloride and trichloromelamine.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life. Fish toxicity: 100 ppm/tns/fish/toxic/freshwater; Aquatic toxicity rating = 10 to 100 ppm/96 h/TLm/freshwater.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Avoid contact and inhalation. Dike to prevent runoff. Notify manufacturer. Notify environmental authorities.

Protective Clothing and Equipment

In fires and confined spaces - Respiratory protection - self-contained breathing apparatus; otherwise, face shield, boots and protective clothing as required.

Fire and Explosion

To extinguish use foam, dry chemical or carbon dioxide. Water may be ineffective, but may be used to keep fire-exposed containers cool.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: eyes - irrigate; skin - wash with soapy water and remove contaminated clothing. Ingestion: do not induce vomiting. Inhalation: if breathing has stopped, give artificial respiration; if laboured, give oxygen. If medical assistance is not immediately available, transport victim to doctor, clinic or hospital.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss cleanup and disposal of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Can be burnt in an incinerator (approval of environmental authorities required).

UREA NH_2CONH_2

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
CARBAMIDE CARBONYLDIAMIDE	White crystals or powder. Odourless, or slight ammonia odour.	Canadian Fertilizers, Medicine Hat, Alta. Cominco, Carseland, Alta. Canadian Industries Ltd., Courtright, Ontario.

Transportation and Storage Information

Shipping State: Solid.
Classification: None.
Inert Atmosphere: No requirement.
Venting: Open.

Label(s): Not regulated.
Storage Temperature: Ambient.

Grades or Purity: Technical, CP, fertilizer (45 to 46% N), feed grade (42% N).
Containers and Materials: Bags, drums, bulk, trucks, train. Also shipped as solution in tank cars or tank trucks.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): 78 g/100 mL (5°C); 119.3 g/100 mL (25°C).
Molecular Weight: 60.1
Vapour Pressure: No information.
Boiling Point: Decomposes above 133°C.

Floatability (Water): Sinks and mixes.
Odour: Odourless, or slight ammonia odour.
Flash Point: Not combustible or flammable.
Vapour Density: No information.
Specific Gravity: 1.34 at 20°C (solid).

Colour: White.
Explosive Limits: Not flammable or combustible.
Melting Point: 133 to 135°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: (dust) sore throat, coughing, shortness of breath. Contact: skin or eyes - causes redness and irritation. Ingestion: sore throat, abdominal pain.
Toxicology: Moderately toxic by inhalation and contact.

TLV® No information.	LC_{50} - No information.	LD_{50} - No information.
Short-term Inhalation Limits - No information.	Delayed Toxicity - None.	LD_{Lo} - Cutaneous: rabbit = 3.0 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used in fires involving urea.
Behaviour in Fire: Not combustible, but urea decomposes at >133°C generating toxic NO_x fumes and ammonia gas.
Ignition Temperature: Not combustible. **Burning Rate:** Not combustible.

Reactivity

With Water: No reaction; soluble.
With Common Materials: Reacts violently with hypochlorites.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 16 000 to 30 000 mg/L/24 h/creek chub/critical range/freshwater; Aquatic toxicity rating >1 000 ppm/96 h/TLm/freshwater; BOD: 9 to 100%, 5 days (temperature dependent).
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from spill site. Dike to prevent runoff from rainwater or water application. Contact manufacturer. Contact environmental authorities.

Protective Clothing and Equipment

In fires, Respiratory protection - self-contained breathing apparatus; otherwise, face shield and protective clothing as required.

Fire and Explosion

Not combustible; most fire extinguishing agents may be used in fires involving urea. Urea decomposes above 133°C producing toxic NO_x fumes and ammonia gas.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: skin - remove contaminated clothing and wash affected area with soap and water; eyes - irrigate with water. Ingestion: give water to drink, do not induce vomiting. If necessary, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. May be buried in landfill site (environmental authorities approval required).

VANADIUM PENTOXIDE V_2O_5

IDENTIFICATION

UN No. 2862

Common Synonyms	Observable Characteristics	Manufacturers
VANADIC ACID ANHYDRIDE VANADIUM OXIDE	Yellow to red crystalline powder. Odourless.	No Canadian manufacturer. U.S. supplier Monsanto Co., St-Louis, MO, USA

Transportation and Storage Information

Shipping State: Solid. **Classification:** Poison. **Inert Atmosphere:** No requirement. **Venting:** No requirement.	**Label(s):** White label - POISON; Class 6.1, Group II. **Storage Temperature:** Ambient.	**Grades or Purity:** Commercial, technical, CP. **Containers and Materials:** Drums, multiwall paper bags.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm)**:** Solid. **Solubility (Water):** 0.8 g/100 mL (20°C). **Molecular Weight:** 181.9 **Vapour Pressure:** No information. **Boiling Point:** Decomposes 1 750°C.	**Floatability (Water):** Sinks. **Odour:** Odourless. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** 3.36 (18°C).	**Colour:** Yellow to red. **Explosive Limits:** Not flammable. **Melting Point:** 690°C.

HAZARD DATA

Human Health

Symptoms: Contact: skin - redness and itch; eyes - redness, pain, watering. Ingestion: metal taste, vomiting, pallour, tremors, gastrointestinal disturbances. Inhalation: coughing, chest pain, respiratory system irritation and greenish-black discolouration of tongue.
Toxicology: Highly toxic by all routes.

TLV® (dust or fume) 0.05 mg/m^3. Short-term Inhalation Limits - No information.	LC_{50} - No information. LC_{Lo} - Inhalation: rat = 70 mg/m^3 (2 h) Delayed Toxocity - No information.	LD_{50} - Oral: rat = 0.01 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents can be used in fires involving vanadium pentoxide.
Behaviour in Fire: Not combustible.

Ignition Temperature: Not combustible.	**Burning Rate:** Not combustible.

Reactivity

With Water: No reaction.
With Common Materials: Can react violently with (Ca + S + H_2O), chlorine trifluoride and lithium.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 13 ppm/96 h/fathead minnow/TLm/softwater; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

POISON.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "POISON". Avoid contact or inhalation of fumes or dust. Stop or reduce discharge, if possible. Notify supplier. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus. Gloves - rubber or PVC. Outer protective clothing as required.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used in fires involving vanadium pentoxide.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: wash eyes and affected skin thoroughly with plenty of water. Ingestion: give conscious victim plenty of water do not induce vomiting. Inhalation: give artificial respiration if required (not mouth-to-mouth method). If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

VINYL ACETATE $CH_3COOCH{:}CH_2$

IDENTIFICATION

UN No. 1301

Common Synonyms	Observable Characteristics	Manufacturers
ACETIC ACID VINYL ESTER ACETIC ACID ETHENYL VAC VAM (Vinyl Acetate Monomer)	Colourless liquid. Unpleasant in high concentrations; sweet pleasant in small quantities.	Celanese Canada Ltd., Edmonton, Alta.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable liquid.
Inert Atmosphere: No requirement.
Venting: Pressure-vacuum.
Pump Type: Carbon or stainless steel (explosion-proof).

Label(s): Red label - FLAMMABLE LIQUID; Class 3.2, Group II.
Storage Temperature: Ambient.
Hose Type: Polyethylene, butyl, neoprene, flexible steel or stainless steel.

Grades or Purity: Technical Grade A, 99.8% (diphenylamine inhibited); grade H, 99.8% (hydroquinone inhibited).
Containers and Materials: Cans, drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): 2.5 g/100 mL (20°C).
Molecular Weight: 86.1
Vapour Pressure: 83 mm Hg (20°C); 100 mm Hg (23.3°C); 115 mm Hg (25°C).
Boiling Point: 72-73°C.

Floatability (Water): Floats.
Odour: Sweet, unpleasant in high concentration (0.12 to 0.55 ppm, odour threshold).
Flash Point: -5°C (o.c.), -8°C (c.c.).
Vapour Density: 3.0
Specific Gravity: 0.93 (20°C).

Colour: Colourless.
Explosive Limits: 2.6 to 13.4%.
Melting Point: -93 to -100°C.

HAZARD DATA

Human Health

Symptoms: Contact: skin and eyes - liquid and vapours irritating. Inhalation: high concentrations produce anaesthetic effect. Ingestion: nausea and vomiting.
Toxicology: Moderately toxic by all routes.
TLV® - (inhalation) 10 ppm; 30 mg/m^3.
Short-term Inhalation Limits - 20 ppm; 60 mg/m^3 (15 min).

LC_{50} - No information.
LC_{Lo} - Inhalation: rat = 4 000 ppm (4 h)
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 2.92 g/kg

Fire

Fire Extinguishing Agents: Use dry chemical or alcohol foam or carbon dioxide. Water may be ineffective, but may be used to cool fire-exposed containers.
Behaviour in Fire: Heat initiates polymerization which could proceed violently. Fire may cause violent rupture of tank. Flashback may occur along vapour trail.
Ignition Temperature: 402°C.
Burning Rate: 3.8 mm/min.

Reactivity

With Water: No reaction; slightly soluble.
With Common Materials: Reacts violently with nitric acid, sulfuric acid, oleum, chlorosulfonic acid, ethylene diamine, hydrochloric acid and peroxides, and hydrofluoric acid.
Stability: Stable if at room temperature and inhibited.

Environment

Water: Prevent entry into water intakes and waterways. Fouling to shoreline. Harmful to aquatic life in very low concentrations. Fish toxicity: 18 ppm/96 h/bluegill/TLm/freshwater; Aquatic toxicity rating = 10 to 100 ppm/96 h/TLm/freshwater; 19 to 39 mg/L/96 h/TLm/fathead minnow/freshwater; BOD: 62%, 5 days (theoretical).
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE. Heat initiates polymerization which could proceed violently.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all sources of ignition. Avoid contact and inhalation. Stay upwind and use water spray to control vapour. Stop or reduce discharge, if this can be done without risk. Contact supplier for guidance. Dike runoff from rainwater or water application. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus. Goggles - (mono), tight fitting. If face shield is used, it should not replace goggles. Suit - (jacket and pants) or coveralls, rubber or plastic. Boots - high, rubber (pants worn outside boots). Gloves - rubber or plastic.

Fire and Explosion

Use dry chemical, carbon dioxide or alcohol foam. Use water spray to knock down vapours and cool fire-exposed containers. Heat initiates polymerization which could proceed violently. Fire may cause violent rupture of tank. Flash back may occur along vapour trail.

First Aid

Move victim out of spill area to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if breathing has stopped. Give oxygen if breathing is laboured. Contact: remove contaminated clothing and wash eyes and skin with plenty of warm water for at least 15 minutes. Ingestion: give conscious victim water to drink. If medical assistance is not immediately available, transport victim to hospital, clinic or doctor.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other material.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Spray into a chemical waste incinerator (approval of environmental authorities required).

VINYL CHLORIDE $H_2C{:}CHCl$

IDENTIFICATION

UN No. 1086

Common Synonyms	Observable Characteristics	Manufacturers
VINYL CHLORIDE MONOMER VCM CHLOROETHYLENE CHLOROETHENE	Colourless, gas or liquid. Sweet odour.	Dow Chemical Canada Inc., Sarnia, Ont., Fort Saskatchewan, Alta.

Transportation and Storage Information

Shipping State: Liquid (compressed gas).
Classification: Flammable.
Inert Atmosphere: No requirement.
Venting: Safety-relief (under pressure); pressure-vacuum (atmospheric pressure).
Pump Type: Steel or stainless steel; positive displacement or gas, explosion-proof.

Label(s): Red label - FLAMMABLE GAS; Class 2.1.
Storage Temperature: Ambient.
Hose Type: Teflon, Viton A; flexible stainless steel.

Grades or Purity: Commercial or technical, 99+% (inhibiter, phenol 40 to 100 ppm may be added).
Containers and Materials: Cylinders, tank cars (steel or stainless steel).

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Gas.
Solubility (Water): 0.006 g/100 mL (10°C); 0.003 g/100 mL (25°C).
Molecular Weight: 62.5
Vapour Pressure: 240 mm Hg (-40°C); 580 mm Hg (-20°C); 2 660 mm Hg (25°C).
Boiling Point: -13.4 to -13.9°C.

Floatability (Water): Liquid, floats.
Odour: Sweet odour (260 to 4 000 ppm, odour threshold).
Flash Point: -78°C (o.c.).
Vapour Density: 2.2
Specific Gravity: 0.97 (-20°C); 0.91 (15°C).

Colour: Colourless.
Explosive Limits: 3.6 to 33%.
Melting Point: -153 to -160°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: irritation to respiratory tract, dizziness, anaesthesia, difficulty breathing, lung irritation, headache, paralysis. Contact: skin - drying, freezing, inflammation; eyes - irritation, watering, inflammation. Ingestion: nausea, vomiting, drowsiness, loss of consciousness, narcosis, shock.
Toxicology: High toxicity upon inhalation and contact.
TLV®- (inhalation) 5 ppm; 10 mg/m^3.
Short-term Inhalation Limits - No information.

LC_{50} - No information.
LC_{Lo} - Inhalation: rat = 6 000 ppm/4 h
TD_{Lo} - Inhalation: rat = 250 ppm/39 weeks
Delayed Toxicity - Recognized carcinogen.

LD_{50} - Oral: rat = 0.5 g/kg
TD_{Lo} - Oral: rat = 34 g/kg

Fire

Fire Extinguishing Agents: Do not put out fire until leak has been shutoff. Water may be used to cool fire-exposed containers.
Behaviour in Fire: Fire may cause violent rupture of tank. Burning releases hydrogen chloride gas. Flashback may occur along vapour trail. Under high temperatures or in contact with certain catalytic impurities, may violently polymerize.
Ignition Temperature: 472°C.
Burning Rate: 4.3 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Can react vigorously with oxidizing materials.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating: >1 000 ppm/96 h/TLm/freshwater; BOD: No information.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all ignition sources. Contact manufacturer for guidance. Stay upwind and use water spray to control vapour. Dike runoff. Stop or reduce discharge if this can be done without risk. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - self-contained breathing apparatus. Boots - high, rubber (pants worn outside boots). Acid suit - (jacket and pants), "slicker suit" - neoprene, or coveralls. Gloves - rubber.

Fire and Explosion

Do not put out fire until leak has been shut off. Use water to cool fire-exposed containers. Fire may cause violent rupture of tank. Flash back may occur along vapour trail. Under high temperatures or in contact with certain catalytic impurities, may violently polymerize.

First Aid

Move victim from spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if breathing has stopped. Give oxygen if breathing is laboured. Contact: remove contaminated clothing and wash eyes and skin with plenty of warm water for at least 15 minutes. Ingestion: unlikely with vinyl chloride but should this happen, give warm water. Keep victim warm and quiet. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

XYLENES (o-, m-, p-) $C_6H_4(CH_3)_2$

IDENTIFICATION

UN No. 1307

Common Synonyms

1,2: 1,3: 1,4 - DIMETHYLBENZENE
XYLOLS
o-, m-, p-dimethylbenzene

Xylenes are typically a mixture of the three isomers, ortho, meta and para, with the last two being the predominant portion.

Observable Characteristics

Colourless liquid. Sweet aromatic odour.

Manufacturers

Finachem, Montreal, Quebec.
Sunchem, Sarnia, Ontario.
Shell Canada, Corunna, Ontario.

Transportation and Storage Information

Shipping State: Liquid.
Classification: Flammable.
Inert Atmosphere: No requirement.
Venting: Open or pressure-vacuum with flame arrester.
Pump Type: Gear or centrifugal. Steel or stainless steel.

Label(s): Red label - FLAMMABLE LIQUID; Class 3.2, Group II.
Storage Temperature: Ambient.
Hose Type: Material should be resistant to aromatic chemical attack.

Grades or Purity: Technical, 99.2%; pure, 99.9%; nitration grade - xylene thinner.
Containers and Materials: Bottles, cans, drums, tank cars, tank trucks; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Liquid.
Solubility (Water): (o-) 0.018 g/100 mL (20°C); (p-) 0.02 g/100 mL (25°C).
Molecular Weight: 106.2
Vapour Pressure: (o-) 5 mm Hg (20°C); 9 mm Hg (30°C); (m-) 6 mm Hg (20°C); 11 mm Hg (30°C); (p-) 6.5 mm Hg (20°C); 12 mm Hg (30°C).
Boiling Point: 144.4°C (o-); 139°C (m-); 138.4 (p-).

Floatability (Water): Floats.
Odour: Sweet aromatic odour (0.05 to 0.27 ppm, odour threshold).
Flash Point: (m-) 27°C; (o-) 32°C; (p-) 27°C.
Vapour Density: 3.7 (o-); 3.66 (m-); 3.65 (p-).
Specific Gravity: 0.88 (o-); 0.86 (m-); 0.86 (p-); (20°C).

Colour: Colourless.
Explosive Limits: (m-, p-) 1.1 to 7%; (o-) 1.0 to 6.0%.
Melting Point: -25°C (o-); -48 (m-); 13.0°C (p-).

HAZARD DATA

Human Health

Symptoms: Inhalation: dizziness, coughing, nausea and vomiting, fatigue, drowsiness, narcosis; Ingestion: gastrointestinal irritation, dizziness, fatigue, loss of consciousness. Contact: eyes - redness, watering, inflammation; skin - dryness, cracking, may be absorbed.
Toxicology: Moderately toxic by inhalation.
TLV® (skin) 100 ppm; 435 mg/m^3.
Short-term Inhalation Limits - (skin) 150 ppm; 655 mg/m^3 (15 min).
Delayed Toxicity - No information.

LC_{50} - No information.
LC_{Lo} - Inhalation: rat = 8 000 ppm/4 h (m-).
LC_{Lo} - Inhalation: rat = 4 912 ppm/24 h (p-).

LD_{50} - Oral: rat = 5.0 g/kg (p-)

Fire

Fire Extinguishing Agents: Use dry chemical, carbon dioxide, foam. Water spray may be used to cool fire-exposed containers.
Behavior in Fire: Containers may rupture in fires. Flash back may occur along vapour trail.
Ignition Temperature: 463°C (o-); 527°C (m-); 528°C (p-).

Burning Rate: 5.8 mm/min.

Reactivity

With Water: No reaction.
With Common Materials: Can react with oxidizing materials.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Aquatic toxicity rating = 10 to 100 mg/L/96 h/TLm/freshwater; ortho 13 mg/L/24 h/goldfish/LD_{50}; meta 16 mg/L/24 h/goldfish/LD_{50}; para 18 mg/L/24 h/goldfish/LD_{50}; 13.5 ppm/96 h/bluegill/LC_{50}/freshwater; 8.2 ppm/96 h/rainbow trout/LC_{50}/freshwater; BOD: 64 to 235%, 5 days.
Land-Air: 800 to 2 400 ppm threshold for common crops.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

FLAMMABLE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "FLAMMABLE". CALL FIRE DEPARTMENT. Eliminate all sources of ignition. Avoid skin contact and inhalation. Stop or reduce discharge if this can be done without risk. Dike to contain spill and prevent runoff. Notify supplier and environmental authorities.

Protective Clothing and Equipment

Respiratory protection - in fires or confined areas, use self-contained breathing apparatus and totally encapsulated suit. Otherwise; Gloves - rubber. Eye protection - optional - goggles or face shield. Boots - rubber (pants worn outside boots).

Fire and Explosion

Use dry chemical, carbon dioxide or foam to extinguish. Water spray may be used to cool fire-exposed containers. Flash back may occur along vapour trail.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Contact: remove contaminated clothing, wash affected parts with plenty of water (and soap if available). Flush eyes with plenty of water. Inhalation: give artificial respiration if breathing has stopped, give oxygen if breathing is laboured. Ingestion: do not induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. If floating, skim and remove.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other material.
4. Remove material with pumps or vacuum equipment and place in appropriate containers.
5. Recover undamaged containers.
6. Absorb residual liquid on natural or synthetic sorbents.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.
3. Incinerate (approval of environmental authorities required).

YELLOW CAKE $UO_2(OH)_{2-x}(O\text{-}y^+)_x$ x = 0,1,2
y+ = Na^+, Mg^+ or NH_4^+

IDENTIFICATION

UN No. 2912

Common Synonyms	Observable Characteristics	Manufacturers
URANIUM CONCENTRATE SYNTHETIC CARNOLITE	Yellow to yellow-brown powder. Odourless.	Eldorado Nuclear, Ottawa, Ont., Eldorado, Sask. Dennison Mines, Rio Algom Ltd., Elliot Lake, Ont. Madawaska Mines, Bancroft, Ont.

Transportation and Storage Information

Shipping State: Solid. **Classification:** Radioactive. **Inert Atmosphere:** No requirement. **Venting:** Open.	**Label(s):** Yellow, white and black label - RADIOACTIVE SUBSTANCE; LSA 1. **Storage Temperature:** Ambient.	**Grades or Purity:** Various, by % Uranium. **Containers and Materials:** Drums; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid. **Solubility (Water):** Insoluble. **Molecular Weight:** Variable. **Vapour Pressure:** No information. **Boiling Point:** No information.	**Floatability (Water):** Sinks. **Odour:** Odourless. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** Variable >1.	**Colour:** Yellow to yellow-brown. **Explosive Limits:** Not flammable. **Melting Point:** No information.

HAZARD DATA

Human Health

Symptoms: Inhalation: (dust) severe respiratory tract irritation. Ingestion: nausea, vomiting. Contact: skin - irritation, yellow colouration of skin.
Toxicology: Moderately toxic by all routes.

TLV*- 0.2 mg/m^3 (as uranium) Short-term Inhalation Limits - 0.6 mg/m^3 (15 min). (as uranium)	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - No information.

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents may be used in fires involving yellow cake..
Behaviour in Fire: Not combustible.
Ignition Temperature: Not combustible. **Burning Rate:** Not combustible.

Reactivity

With Water: No reaction.
With Common Materials: No information.
Stability: Radioactivity relatively low level of gamma radiation.

Environment

Water: Prevent entry into water intakes and waterways.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

RADIOACTIVE

Immediate Responses

Keep non-involved people away from spill site. Notify Atomic Energy Control Board. Notify manufacturer or supplier. Notify environmental authorities.

Protective Clothing and Equipment

Outer protective clothing as required.

Fire and Explosion

Not combustible. Most fire extinguishing agents may be used in fires involving yellow cake.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped give artificial respiration; if laboured, give oxygen. Contact: skin - remove contaminated clothing and flush affected areas with plenty of water; eyes - irrigate with plenty of water. Ingestion: give conscious victim plenty of water to drink and induce vomiting. If medical assistance is not immediately available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Notify the Atomic Energy Control Board.
2. Stop or reduce discharge if safe to do so.
3. Contact manufacturer or supplier for advice.
4. If possible, contain discharge by damming or water diversion.
5. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
6. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Notify the Atomic Energy Control Board.
2. Stop or reduce discharge if safe to do so.
3. Contact manufacturer or supplier for advice.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Notify the Atomic Energy Control Board.
2. Contact manufacturer or supplier for advice on disposal.
3. Contact environmental authorities for advice on disposal.

YELLOW CAKE $UO_2(OH)_{2-x}(O\text{-}y^+)_x$ $x = 0,1,2$ $y^+ = Na^+, Mg^+$ or NH_4^+

ZINC Zn

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
GRANULAR POWDER ZINC ZINC DUST	Shiny white metal with bluish-grey lustre or blue-grey to black powder or dust. Odourless.	Cominco, Trail, B.C. Canadian Electrolytic Zinc, Valleyfield, Que. Texasgulf Canada, Hoyle, Ontario.

Transportation and Storage Information

Shipping State: Solid.
Classification: None.
Inert Atmosphere: No requirement.
Venting: No requirement.

Label(s): Not regulated.
Storage Temperature: Ambient.

Grades or Purity: Zinc dust, 99.0%+; zinc powder, 99.0%; intermediate 99.5%; high grade 99.9%.
Containers and Materials: Cans, drums, bulk by truck or rail.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility (Water): 0.00007 g/100 mL (25°C).
Molecular Weight: 65.4
Vapour Pressure: 0.13 mm Hg (487°C).
Boiling Point: 907°C.

Floatability (Water): Sinks.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: 7.1 (25°C).

Colour: Blue-grey to black.
Explosive Limits: Dust forms explosive mixtures with air.
Melting Point: 420°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: (dust) coughing, fever and muscular aches.
Toxicology: Low toxicity by inhalation.
TLV® (inhalation) 5 mg/m^3 (as ZnO fume).
Short-term Inhalation Limits - 10 mg/m^3 (as ZnO fume).

LC_{50} - No information.
TC_{Lo} - Inhalation: human = 124 mg/m^3 (50 min).
Delayed Toxicity - No information.

LD_{50} - No information.

Fire

Fire Extinguishing Agents: In fires use carbon dioxide, dry chemical, or sand.
Behaviour in Fire: When heated, releases highly toxic zinc fumes. Zinc dust may form explosive mixtures in air.
Ignition Temperature: 460°C (dust layer); 680°C (dust cloud).
Burning Rate: No information.

Reactivity

With Water: No reaction.
With Common Materials: Dust reacts with acids, chlorites, chlorine, fluorine, hydrazine, potassium nitrate, sulfur, cadmium, chlorates, chromic anhydride, nitric acid, performic acid, potassium chromate, potassium peroxide, selenium, sodium chlorate, sodium peroxide, and ammonium nitrate. In contact with acidic or alkali solutions can result in the evolution of hydrogen.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Toxic to aquatic life in low concentrations (freshwater 0.026 to 0.09 mg/L; saltwater 0.14 to 0.22 mg/L); Zn^{2+}/48 h/rainbow trout/TLm/freshwater; BOD: Not available.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

Dust concentrations may be explosive.

Immediate Responses

Keep non-involved people away from spill site. If zinc dust is involved, caution should be taken in confined area because of explosive potential. Stop discharge if possible. Contact supplier or manufacturer. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - in fires or confined areas use self-contained breathing apparatus; otherwise, protective clothing as necessary.

Fire and Explosion

Use carbon dioxide and dry chemical.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: if breathing has stopped, give artificial respiration; if laboured give oxygen. Victim should be taken to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by booming.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material by manual or mechanical means.
5. Recovery undamaged containers.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

ZINC CHLORIDE $ZnCl_2$

IDENTIFICATION

UN No. 8159 solution
8160 anhydrous

Common Synonyms	Observable Characteristics	Manufacturers
BUTTER OF ZINC (granular) ZINC DICHLORIDE SOLUTION ZINC MURIATE SOLUTION	White, granular, crystal or powder or clear solution. Odourless.	Canadian Industries Ltd., Montreal, Quebec.

Transportation and Storage Information

Shipping State: Solid or liquid (solution).
Classification: Corrosive.
Inert Atmosphere: No requirement.
Venting: Open.
Pump Type: Gear, centrifugal; rubber or plastic lined; stainless steel (solutions only).

Label(s): White and black label - CORROSIVE; Class 8, Group III.
Storage Temperature: Ambient.
Hose Type: Natural rubber, polyethylene, polypropylene, Chemiflex 951 (solutions only).

Grades or Purity: Solid; CP or technical; Solutions, 50% or 62.5%.
Containers and Materials: Drums, tank cars, tank trucks; lined stainless steel or fibreglass.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm): Solid.
Solubility: 432 g/100 mL (25°C); 614 g/100 mL (100°C).
Molecular Weight: 136.3
Vapour Pressure: 1 mm Hg (428°C).
Boiling Point: 732°C.

Floatability (Water): Sinks and mixes.
Odour: Odourless.
Flash Point: Not flammable.
Vapour Density: No information.
Specific Gravity: Solution, 1.61 (15.5°C); Solid, 2.9 (25°C).

Colour: White, solid or clear solution.
Explosive Limits: Not flammable.
Melting Point: 283 to 290°C.

HAZARD DATA

Human Health

Symptoms: Contact: may cause severe skin irritation and serious eye injury. Ingestion: swallowing large amount may cause abdominal pains, nausea, diarrhea and shock. Inhalation: irritation of nose and throat, headache, cough, chest pain, fever, nausea.
Toxicology: Highly toxic by inhalation. Moderately toxic by ingestion and contact.
TLV® (inhalation) 1 mg/m^3 (as $ZnCl_2$ fume).
Short-term Inhalation Limits - 2 mg/m^3 (15 min) (as $ZnCl_2$ fume).

LC_{50} - No information.
TC_{Lo} - Inhalation: man = 4 800 mg/m^3 (30 min).
Delayed Toxicity - No information.

LD_{50} - Oral: rat = 0.35 g/kg

Fire

Fire Extinguishing Agents: Not combustible. Most fire extinguishing agents can be used on fires involving zinc chloride.
Behaviour in Fire: Not combustible, but when heated to decomposition, emits corrosive hydrogen chloride gas.
Ignition Temperature: Not combustible.
Burning Rate: Not combustible.

Reactivity

With Water: No reaction; soluble.
With Common Materials: In contact with most acids, corrosive hydrogen chloride is produced. Reacts violently with potassium and is corrosive to most metals.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Harmful to aquatic life in low concentrations. Fish toxicity: 7.2 ppm/96 h/bluegill/TLm/freshwater; 28 ppm/48 h/zebrafish/TLm/saltwater; 0.10 ppm/48 h/*Daphnia magna*/LC_{50}/continuous flow; BOD: None.
Land-Air: No information.
Food Chain Concentration Potential: None.

EMERGENCY MEASURES

Special Hazards

CORROSIVE.

Immediate Responses

Keep non-involved people away from spill site. Issue warning: "CORROSIVE". Stop or reduce discharge if this can be done without risk. Avoid contact. Contain spill by diking to prevent entry into watercourses and sewers. Notify manufacturer or supplier. Notify environmental authorities.

Protective Clothing and Equipment

Respiratory protection - in fires or confined spaces use self-contained breathing apparatus; otherwise, Goggles - (mono), tight fitting. If face shield is used, it must not replace goggles. Gloves - rubber. Boots - high, rubber (pants worn outside boots). Outerwear as required, coveralls, apron, etc. For dusts (granular product), dust respirator may be needed.

Fire and Explosion

Not combustible. In fires involving $ZnCl_2$, most fire extinguishing agents may be used. When heated to decomposition, may emit corrosive hydrogen chloride gas.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: remove victim to fresh air, get medical attention. Contact: eyes - irrigate with plenty of water for at least 15 minutes; skin - wash exposed skin with plenty of water; at same time, remove contaminated clothing. Ingestion: If victim is conscious, give large amounts of milk or water. If medical assistance is not quickly available, transport victim to hospital, doctor or clinic.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminants bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Dike to prevent runoff from rainwater or water application.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

ZINC OXIDE ZnO

IDENTIFICATION

Common Synonyms	Observable Characteristics	Manufacturers
ZINC WHITE CHINESE WHITE ZINCITE	White to yellow-white or grey powder. Odourless.	Zochem, Bramalea, Ontario. Pigment and Chemical, Milton, Ontario. Produits Chemiques, GH, St. Hyacinthe, Quebec.
Transportation and Storage Information		
Shipping State: Solid. **Classification:** None. **Inert Atmosphere:** No requirement. **Venting:** Open.	**Label(s):** Not regulated. **Storage Temperature:** Ambient.	**Grades or Purity:** Lead-free; leaded. **Containers and Materials:** Boxes, drums, multi-wall paper bags.
Physical and Chemical Characteristics		
Physical State (20°C, 1 atm): Solid. **Solubility (Water):** 0.00016 mg/100 mL (29°C). **Molecular Weight:** 81.4 **Vapour Pressure:** No information. **Boiling Point:** Sublimes >1 800°C.	**Floatability (Water):** Sinks. **Odour:** Odourless. **Flash Point:** Not flammable. **Vapour Density:** 2.0 **Specific Gravity:** 5.6 (20°C).	**Colour:** White to yellow-white or grey. **Explosive Limits:** Not combustible. Not flammable. **Melting Point:** 1 975°C (sublimes at temperatures >1 800°C).

HAZARD DATA

Human Health

Symptoms: Inhalation: (fumes) fever, chills, nausea, vomiting, muscular aches, and weakness. Ingestion: metallic taste in mouth, nausea and vomiting.
Toxicology: Moderately toxic upon inhalation or ingestion.

TLV® 5 mg/m^3 (ZnO fumes). Short-term Inhalation Limits - 10 mg/m^3 (15 min) (ZnO fumes).	LC_{50} - No information. Delayed Toxicity - No information. TC_{Lo} - Inhalation = 600 mg/m^3 (30 min).	LD_{50} - Oral: rat = 0.63 g/kg

Fire

Fire Extinguishing Agents: Not combustible; most fire extinguishing agents may be used in fires involving ZnO.
Behaviour in Fire: Not combustible; toxic ZnO fumes can be formed in fires.
Ignition Temperature: Not combustible. **Burning Rate:** Not combustible.

Reactivity

With Water: No reaction.
With Common Materials: Reacts violently with magnesium.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from spill site. Call manufacturer or supplier for advice. Stop or reduce discharge if safe to do so. Contact environmental authorities.

Protective Clothing and Equipment

In fires, Respiratory protection - self-contained breathing apparatus; otherwise, suitable dust respirator and protective clothing as required.

Fire and Explosion

Not combustible; in fires involving zinc oxide; most fire extinguishing agents may be used.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration if necessary. Contact: skin - remove contaminated clothing and flush affected areas with water; eyes - irrigate with large amounts of water. Ingestion: give water to drink. If medical assistance is not immediately available, transport victim to doctor, clinic or hospital.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Land-Air

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. Contain spill by diking with earth or other barrier.
4. Remove material by manual or mechanical means.
5. Recover undamaged containers.
6. Remove contaminated soil for disposal.
7. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

Disposal

1. Contact manufacturer or supplier for advice on disposal.
2. Contact environmental authorities for advice on disposal.

ZINC SULFATE $ZnSO_4 \cdot xH_2O$ (x = 0,1,7)

IDENTIFICATION

UN No. NA9161

Common Synonyms	Observable Characteristics	Manufacturers
ZINC SULFATE MONOHYDRATE ZINC SULFATE HEPTAHYDRATE - White Vitriol - White Copperas - Zinc Vitriol ZINC SULPHATE	Anhydrous form; colourless, crystals. Hydrous forms; White, crystalline powder. Odourless.	Cominco, Trail, B.C. Canadian Electrolytic Zinc, Valleyfield, Quebec. Texasgulf Canada, Timmins, Ontario.

Transportation and Storage Information

Shipping State: Solid. **Classification:** None. **Inert Atmosphere:** No requirement. **Venting:** Open.	**Label(s):** Not regulated, Class 9.2, Group I. **Storage Temperature:** Ambient.	**Grades or Purity:** Commercial, Technical. **Containers and Materials:** Bags, fibre drums, drums; steel.

Physical and Chemical Characteristics

Physical State (20°C, 1 atm)**:** Solid. **Solubility** (Water)**:** 96.5 g/100 mL (20°C); (hepta). **Molecular Weight:** 161.4 (anhydrous); 179.4 (mono); 287.5 (hepta). **Vapour Pressure:** No information. **Boiling Point:** Anhydrous 600°C (decomposes); heptahydrate loses H_2O 280°C; monohydrate loses H_2O >238°C.	**Floatability** (Water)**:** Sinks. **Odour:** Odourless. **Flash Point:** Not flammable. **Vapour Density:** No information. **Specific Gravity:** Heptahydrate 1.96 (25°C); anhydrous 3.5 (25°C).	**Colour:** Colourless to white. **Explosive Limitss:** Not flammable. **Melting Point:** (hepta) 100°C; loses water at 280°C; monohydrate loses water at 238°C; all decompose above 500°C.

HAZARD DATA

Human Health

Symptoms: Inhalation: sore throat, coughing, shortness of breath, laboured breathing. Contact: eyes and skin - redness and pain. Ingestion: abdominal spasms, vomiting and diarrhea.
Toxicology: Moderately toxic by inhalation and contact.

TLV® No information. Short-term Inhalation Limits - No information.	LC_{50} - No information. Delayed Toxicity - No information.	LD_{50} - Intraperitoneal: mouse = 0.029 g/kg LD_{Lo} - Oral: rat = 2.2 g/kg (hepta)

Fire

Fire Extinguishing Agents: Not combustible; most fire extinguishing agents may be used in fires involving zinc sulfate.
Behaviour in Fire: Not combustible.

Ignition Temperature: Not combustible.	**Burning Rate:** Not combustible.

Reactivity

With Water: No reaction.
With Common Materials: No information.
Stability: Stable.

Environment

Water: Prevent entry into water intakes and waterways. Fish toxicity: 4.6 ppm/96 h/rainbow trout/LC_{50}/freshwater; 0.3 mg/L (Zn)/120 h/stickleback/lethal/freshwater; BOD: Not available.
Land-Air: No information.
Food Chain Concentration Potential: No information.

EMERGENCY MEASURES

Special Hazards

Immediate Responses

Keep non-involved people away from spill site. Dike spill area, particularly if there is any danger of water runoff from fire fighting or rain. Lightly wet down dry spillage, if there is any danger of dust drift from wind. Notify environmental authorities. Notify supplier or manufacturer.

Protective Clothing and Equipment

Wear dust mask if necessary. Other protective equipment; gloves, goggles, coveralls, if required.

Fire and Explosion

Not combustible; in fires involving zinc sulfate, most fire extinguishing agents may be used.

First Aid

Move victim out of spill site to fresh air. Call for medical assistance, but start first aid at once. Inhalation: give artificial respiration, if necessary. Contact: skin - remove contaminated clothing and flush affected areas with water; eyes - irrigate with large amounts of water. Ingestion: give water to drink. If medical assistance is not immediately available, transport victim to doctor, clinic or hospital.

ENVIRONMENTAL PROTECTION MEASURES

Response

Water

1. Stop or reduce discharge if safe to do so.
2. Contact manufacturer or supplier for advice.
3. If possible, contain discharge by damming or water diversion.
4. Dredge or vacuum pump to remove contaminants, liquids and contaminated bottom sediments.
5. Notify environmental authorities to discuss disposal and cleanup of contaminated materials.

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Common Abbreviations

BOD	biological oxygen demand
b.p.	boiling point
c.c.	closed cup
cm	centimetre
COD	chemical oxygen demand
conc.	concentration
g	gram
ha	hectare
Hg	mercury
IDLH	immediately dangerous to life and health
Imp. gal.	imperial gallon
in.	inch
J	joule
kg	kilogram
kJ	kilojoule
km	kilometre
kPa	kilopascal
kt	kilotonne
L	litre
lb.	pound
LC_{50}	lethal concentration fifty
LC_{Lo}	lethal concentration low
LD_{50}	lethal dose fifty
LD_{Lo}	lethal dose low
LEL	lower explosive limit
LFL	lower flammability limit
m	metre
m	meta
M	molar
MAC	maximum acceptable concentration
max	maximum
mg	milligram
µg	microgram
µm	micrometre
°Be	degrees Baumé (density)
MIC	maximum immission concentration
min	minute or minimum
mm	millimetre
m.p.	melting point
MW	molecular weight
N	newton
nm	nanometre
o	ortho
o.c.	open cup
p	para
PEL	permissible exposure level
pH	measure of acidity/alkalinity
ppb	parts per billion
ppm	parts per million
P_s	standard pressure
psi	pounds per square inch
s	second
STEL	short-term exposure limit
STIL	short-term inhalation limit
TC_{Lo}	toxic concentration low
T_d	decomposition temperature
TD_{Lo}	toxic dose low
TL_m	median tolerance limit
TLV	Threshold Limit Value
tns	time period not specified
T_s	standard temperature
TWA	time weighted average
UEL	upper explosive limit
UFL	upper flammability limit
v/v	volume per volume
w/s	weight per weight