

Copper / Copper Alloys



Millard Wire & Specialty Strip Co.
 449 Warwick Industrial Drive
 Warwick, R.I. 02886-2416
 p. 401-737-9330
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 www.millardwire.com

Safety Data Sheet

According to Federal Register / Bol. 77, No. 58 / Monday, March 26, 2012

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SECTION 1: IDENTIFICATION

1.1. Product Identifier

Product Form: Mixture

Product Name: Copper/Copper Alloys

Synonyms: Cu, Brass, Bronze, Gilding, Cooper Nickel, Nickel Silver

1.2. Intended Use of the Product

Use of the Substance/Mixture: No use is specified.

1.3. Name, Address, and Telephone of the Responsible Party

Millard Wire & Specialty Strip Co.

449 Warwick Industrial Drive

Warwick, RI 02886-2416

Tel: 401-737-9330

1.4. Emergency Telephone Number

Emergency Number: 401-737-9330

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of Substance or Mixture

Classification (GHS-US)

Not Classified, Copper and copper alloys are considered an "article" and not hazardous in its solid form.

However, certain process such as cutting, milling, grinding, melting and welding could result in some hazardous materials being emitted. The GHS Classification below pertains to these emitted products during these processes.

2.2. Label Elements

GHS-US Labeling: No Labeling Applicable in solid form, in dust form the following apply:

SYMBOL	HAZARD	GHS	HAZARD STATEMENTS
	Carcinogenicity Respiratory Sensitizer Toxic to Reproduction STOT (repeated exposure)	Category = 2 Category = 1 Category = 1B Category = 1	May cause cancer. May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause genetic effects. Causes damage to organs through prolonged or repeated exposure.
	Skin Sensitizer STOT (single exposure)	Category = 1 Category = 1	May cause allergic skin reaction. May cause respiratory irritation
	Acute Toxic to Aquatic Life Chronic Toxic to Aquatic Life	Category = 1 Category = 1	Very toxic to aquatic life. Very toxic to aquatic life with long lasting effects.
N/A	Eye Irritation	Category = 2B	Causes eye irritations.

2.3. Other Hazards

This product is present in a massive form as an alloy. It does not present the same hazards when the individual components are in their powdered forms. The materials present in this product in their powdered forms present aquatic toxicity to the environment, pyrophoricity, flammability, self-heating capabilities, carcinogenicity, water reactivity, and acute toxicity. When processed or where dust is generated a combustible dust hazard may be present. Avoid generating dust, generating sparks, ignition sources, and take all precautions.

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Inhalation of dusts and fumes can cause metal fume fever. Symptoms can include a metallic or sweet taste in the mouth, sweating, shivering, headache, throat irritation, fever, chills, thirstiness, muscle aches, nausea, vomiting, weakness, fatigue, and shortness of breath.

Under normal use and handling of the solid form of this material there are few health hazards. Cutting, welding, melting, grinding etc. of these materials will produce dust, fume or particulate containing the component elements of these materials. Exposure to the dust, fume or particulate of these materials may present significant health hazards. Exposure to dust or fume may cause irritation of the eyes, skin and respiratory tract. Fine particulates dispersed in air may present an explosion hazard.

2.4. Unknown Acute Toxicity (GHS-US):

No data available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Name	Product Identifier (CSD No)	% (w/w)	Classification (GHS-US)
Copper (Cu)	7440-50-8	45-60, 60-99	Comb. Dust Aquatic Acute 1, H400 Aquatic Chronic 3 H412
Aluminum (Al)	7429-90-5	<0.1, 0.1-1, 1-5, 5-10, 10-14	Comb. Dust Flam. Sol. 1, H228 Water-react. 2, H261
Antimony (Sb)	7440-36-0	<0.1	Acute toxicity, Oral (Category 4), H302 Acute toxicity, Inhalation (Category 4), H332 Acute aquatic toxicity (Category 2), H401 Chronic aquatic toxicity (Category 2), H411
Arsenic (As)	7440-38-2	< 0.1, 0.1 - 0.5	Acute Tox. 2 (Oral), H300 Acute Tox. 3 (Inhalation: dust, mist), H331 Carc. 1A, H350 Aquatic Acute 1, H400 Aquatic Chronic 1, H410
Beryllium (Be)	7440-41-7	< 0.1, 0.1 - 1, 1 - 2	Acute Tox. 2 (Inhalation: dust, mist), H330 Carc. 2, H351 STOT RE 1, H372
Bismuth (Bi)	7440-69-9	< 0.1, 0.1 - 1, 1 - 3	Not classified
Boron (B)	7440-42-8	< 0.1, 0.1 - 1, 1 - 1.8	Acute Oral 4, H335
Cadmium (Cd)	7440-43-9	< 0.1, 0.1 - 1	Acute Tox. 4 (Oral), H302 Acute Tox. 2 (Inhalation: dust, mist), H330 Muta. 2, H341 Carc. 1B, H350 Repr. 2, H361 STOT RE 1, H372 Aquatic Acute 1, H400 Aquatic Chronic 1, H410
Chromium (Cr)	7440-47-3	< 0.1, 0.1 - 1, 1 - 3	Aquatic Environment Acute 1, P273 Aquatic Environment Chronic 1, P273 Aquatic Acute , H400 Aquatic Chronic, H400
Cobalt (Co)	7440-48-4	< 0.1, 0.1 - 1, 1 - 3	Acute Tox. 4 (Oral), H302 Acute Tox. 1 (Inhalation: dust, mist), H330 Eye Irrit. 2A, H319

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			Resp. Sens. 1B, H334 Skin Sens. 1, H317 Carc. 2, H351 Repr. 2, H361 Aquatic Acute 3, H402 Aquatic Chronic 1, H410
Iron oxide (Fe)	1309-37-1	< 0.1, 0.1 - 1, 1 - 5, 5 - 6	Not classified
Lead (Pb)	7439-92-1	<0.1, 0.1-1, 1-5, 5-10, 10-16	Acute Tox. 4 (Oral), H302 Acute Tox. 4 (Inhalation: dust, mist), H332 Carc. 1B, H350 Repr. 1A, 360 STOT RE 1, H372 Aquatic Acute 1, H400 Aquatic Chronic 1, H410
Magnesium (Mg)	7439-95-4	< 0.1, 0.1 - 1, 1 - 5	Flam. Sol. 1 Self-heat. 1 Water-react. 2; H228, H251, H261
Manganese (Mn)	7439-96-5	< 0.1, 0.1 - 1, 1 - 5	Comb. Dust
Nickel (Ni)	7440-02-0	<0.1, 0.1-1, 1-5, 5-10, 10-30, 30-33	Skin Sens. 1, H317 Carc. 2, H351 STOT RE 1, H372 Aquatic Acute 1, H400 Aquatic Chronic 3, H412
Phosphorus (P)	7723-14-0	<0.1, 0.1 1.1, 1.1 - 2.0	GHS Classification in accordance with 29 CFR 1910 (OSHA HCS) Flammable solids (Category 3), H228 Acute aquatic toxicity (Category 3), H402 Chronic aquatic toxicity (Category 3), H412
Selenium (Se)	7782-49-2	< 0.1, 0.1 - 1.0	Acute Tox. 3; STOT RE 2; Aquatic Chronic 4; H301 + H331, H373, H413
Silicon (Si)	7440-21-3	< 0.1, 0.1 - 1, 1 - 5	Comb. Dust
Silver (Ag)	7440-22-4	< 0.1, 0.1 - 1.0, 1.0 - 3.0	Not classified
Sulfur (S)	7446-09-5	<0.1, 0.1-0.3	Compressed gas, H280 Acute Tox. 3 (Inhalation: gas), H331 Skin Corr. 1B, H314 Eye Dam. 1, H318
Tellurium (Te)	13494-80-9	< 0.1, 0.1 - 1	Acute Tox. 4; Skin Sens. 1B; Repr. 1B; Aquatic Acute 3; Aquatic Chronic 3; H317, H332, H360, H412
Thallium (Tl)	7440-28-0	< 0.1, 0.1 - 1, 1 - 4	Acute Tox. 2 (Oral), H300 Acute Tox. 2 (Inhalation), H330 Muta. 1B, H340 Repr. 1A, H360 STOT RE 2, H373
Tin (Sn)	7440-31-5	<0.1, 0.1-1, 1-5, 5-10, 10-14	Comb. Dust
Titanium (Ti)	7440-32-6	< 0.1, 0.1 - 1.0, 1 - 5	Comb. Dust
Zinc (Zn)	1314-13-2	<0.1, 0.1-1, 1-5, 5-10, 10-30, 30-40	Aquatic Acute 1, H400 Aquatic Chronic 1, H410
Zirconium (Zr)	7440-67-7	< 0.1, 0.1 - 0.5	Flam. Sol. 1, H228

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Full text of H-phrases: See section 16

More than one of the ranges of concentration prescribed by Controlled Products Regulations has been used where necessary due to varying composition.

SECTION 4: FIRST AID MEASURES

4.1. Description of First Aid Measures

General: IF exposed or concerned: Get medical advice/attention. Never give anything by mouth to an unconscious person.

Inhalation: When symptoms occur: go into open air and ventilate suspected area. Keep at rest and in a position comfortable for breathing. Obtain medical attention if breathing difficulty persists.

Skin Contact: Cool skin rapidly with cold water after contact with molten product. Removal of solidified molten material from skin requires medical assistance. Remove contaminated clothing. Drench affected area with water for at least 15 minutes. Wash with plenty of soap and water. Wash contaminated clothing before reuse. Obtain medical attention if irritation persists.

Eye Contact: Removal of solidified molten material from the eyes requires medical assistance. Immediately rinse with water for a prolonged period (minimum 15 minutes) while holding eyelids wide open. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if irritation develops or persists.

4.2. Most Important Symptoms and Effects both Acute and Delayed

General: Welding, cutting, or processing this material may release dust or fumes that are hazardous.

Inhalation: Inhalation of dusts and fumes can cause metal fume fever. Symptoms can include a metallic or sweet taste in the mouth, sweating, shivering, headache, throat irritation, fever, chills, thirstiness, muscle aches, nausea, vomiting, weakness, fatigue, and shortness of breath.

Skin Contact: May cause an allergic skin reaction. Dust from physical alteration of this product causes skin irritation. Causes severe skin burns. Contact with fumes or metal powder will irritate skin. Contact with hot, molten metal will cause thermal burns. Dust may cause irritation in skin folds or by contact in combination with tight clothing. Mechanical damage via flying particles and chipped slag is possible.

Eye Contact: Dust may cause mechanical irritation to eyes, nose, throat, and lungs.

Ingestion: Ingestion is likely to be harmful or have adverse effects.

Chronic Symptoms: In massive form, no hazard exists. If physically altered to present slivers, ribbons, dusts or fumes from molten material: Aluminum: Inhalation of finely divided aluminum powder may cause pulmonary fibrosis. Inhalation of iron oxide fumes undergoing decomposition may cause irritation and flu-like symptoms, otherwise iron oxide is not hazardous. Inhalation of Nickel compounds has been shown in studies to provide an increased incidence of cancer of the nasal cavity, lung and possibly larynx in nickel refinery workers. Nickel: May cause a form of dermatitis known as nickel itch and intestinal irritation, which may cause disorders, convulsions and asphyxia. Zinc: Prolonged exposure to high concentrations of zinc fumes may cause "zinc shakes", an involuntary twitching of the muscles. Otherwise, zinc is non-toxic. Manganese: Chronic exposure can cause inflammation of the lung tissue, scarring the lungs (pulmonary fibrosis). Copper: Overexposure to fumes may cause metal fume fever (chills, muscle aches, nausea, fever, dry throat, cough, weakness, and lassitude); metallic or sweet taste; discoloration of skin and hair. Tissue damage of mucous membranes may follow chronic dust exposure. Silicon: Can cause chronic bronchitis and narrowing of the airways. Lead: Exposure can result in lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; encephalopathy; kidney disease; hypertension. May cause genetic defects. May damage fertility. May damage the unborn child. Beryllium: Over time inhalation of dust and fumes from this product in certain individuals may cause Chronic Beryllium Disease. This causes allergic reactions in sensitized individuals in the lungs, possibly resulting in pulmonary fibrosis, and can even be fatal.

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Beryllium is a known carcinogen. Take appropriate precautions for workers exposure to Beryllium compounds, avoid breathing dust, and fumes from this product. Tin: Has been shown to increase incidence of sarcoma in animal tests. Chronic exposure to tin dusts and fume may result in "stenosis", a mild form of pneumoconiosis.

4.3. Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention.

SECTION 5: FIRE-FIGHTING MEASURES

5.1. Extinguishing Media

Suitable Extinguishing Media: Use extinguishing media appropriate for surrounding fire. Dry sand; Class D Extinguishing Agent (for metal powder fires).

Unsuitable Extinguishing Media: Do not use heavy water stream. Use of heavy stream of water may spread fire. Do not use water when molten material is involved, may react violently or explosively on contact with water.

5.2. Special Hazards Arising from the Substance or Mixture

Fire Hazard: A non-combustible material, not considered flammable but will melt above 1470°F (800°C)

Explosive Hazard: In Molten state: reacts violently with water (moisture).

Reactivity: Hazardous reactions will not occur under normal conditions.

5.3. Advice for Firefighters

Precautionary Measures: Under fire conditions, hazardous fumes will be present.

Firefighting Instructions: Exercise caution when fighting any chemical fire.

Protection during Firefighting: Do not enter fire area without proper protective equipment, including respiratory protection.

Hazardous Combustion Products: Oxides of tin, nickel, copper, chromium, silicone, carbon, lead, aluminum, and cobalt.

5.4. Reference to Other Sections

Refer to section 9 for flammability properties.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Do not handle until all safety precautions have been read and understood. Do not breathe vapors from molten product.

6.1.1. For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protection equipment (PPE).

Emergency Procedures: Evacuate unnecessary personnel.

6.1.2. For Emergency Personnel

Protection Equipment: Equip cleanup crew with proper protection.

Emergency Procedures: Ventilate area.

6.2. Environmental Precautions

Prevent entry to sewers and public waters.

6.3. Methods and Material for Containment and Clean Up

For Containment: Contain and collect as any solid.

Methods for Cleaning Up: Clear up spills immediately and dispose of waste safely. For particulates and dust: Avoid actions that cause dust to become airborne during clean-up such as dry sweeping or using compressed air. Use HEPA vacuum or thoroughly wet with water and clean-up dist. Use PPE as described in Section 8. Vacuum must be fitted with HEPA filter to prevent release of particulates during clean-up.

6.4. Reference to Other Sections

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See heading 8, Exposure Controls and Personal Protection. Concerning disposal elimination after cleaning, see item 13.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for Safe Handling

Additional Hazards When Processed: may generate flammable/explosive dusts or turnings when brushed, machined or ground. Use care during processing to minimize generation of dust. Where excessive dust may result, use approved respiratory protection equipment. Heating of product can release toxic or irritating fumes; ensure proper ventilation is employed, proper precautions are enforced, and applicable regulations are followed. Inhalation of fumes may cause metal fume fever.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work. Do not eat, drink or smoke when using this product. Contaminated work clothing should be allowed out of the workplace. Wash contaminated clothing before reuse.

7.2. Conditions for Safe Storage, Including any Incompatibilities

Storage Conditions: Store in a dry, cool and well-ventilated place.

Incompatible Materials: Strong acids, strong alkalis or bases, strong oxidizers, metal oxides, water, humidity. Corrosive substances in contact with metals may produce flammable hydrogen gas.

7.3. Specific End Use(s)

No use is specified.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1. Control Parameters

Product:

Copper Alloy		
Mexico	OEL TWA (mg/m ³)	0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist)
USA ACGIH	ACGIH TWA (mg/m ³)	0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist)
USA OSHA	OSHA PEL (TWA) (mg/m ³)	0.1 mg/m ³ (fume) 1 mg/m ³ (dust and mist)
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	0.1 mg/m ³ (fume) 1 mg/m ³ (dust and mist)
CANADA	ACGIH TWA (mg/m ³)	0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist)

Ingredients:

For substances listed in Section 3 that are not listed here, there are no established exposure limits from the manufacturer, supplier, importer, or the appropriate advisory agency including: ACGIH (TLV), NIOSH (REL), OSHA (PEL), Canadian provincial governments, or the Mexican government.

Copper (7440-50-8)		
Mexico	OEL TWA (mg/m ³)	0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist)
Mexico	OEL STEL (mg/m ³)	2 mg/m ³ (fume) 2 mg/m ³ (dust and mist)
USA ACGIH	ACGIH TWA (mg/m ³)	0.2 mg/m ³ (fume)
USA OSHA	OSHA PEL (TWA) (mg/m ³)	0.1 mg/m ³ (fume) 1 mg/m ³ (dust and mist)
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	1 mg/m ³ (dust and mist) 0.1 mg/m ³ (fume)
USA IDLH	US IDLH (mg/m ³)	100 mg/m ³ (dust, fume and mist)
Alberta	OEL TWA (mg/m ³)	0.2 mg/m ³ (fume)
British Columbia	OEL TWA (mg/m ³)	1 mg/m ³ (dust and mist)
Manitoba	OEL TWA (mg/m ³)	0.2 mg/m ³ (fume)
New Brunswick	OEL TWA (mg/m ³)	0.2 mg/m ³ (fume)
Newfoundland & Labrador	OEL TWA (mg/m ³)	0.2 mg/m ³ (fume)

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Nova Scotia	OEL TWA (mg/m ³)	0.2 mg/m ³ (fume)
Nunavut	OEL STEL (mg/m ³)	0.6 mg/m ³ (fume)
Nunavut	OEL TWA (mg/m ³)	0.2 mg/m ³ (fume)
Northwest Territories	OEL STEL (mg/m ³)	0.6 mg/m ³ (fume)
Northwest Territories	OEL TWA (mg/m ³)	0.2 mg/m ³ (fume)
Ontario	OEL TWA (mg/m ³)	0.2 mg/m ³ (fume)
Prince Edward Island	OEL TWA (mg/m ³)	0.2 mg/m ³ (fume)
Québec	VEMP (mg/m ³)	0.2 mg/m ³ (fume)
Saskatchewan	OEL STEL (mg/m ³)	0.6 mg/m ³ (fume)
Saskatchewan	OEL TWA (mg/m ³)	0.2 mg/m ³ (fume)
Yukon	OEL STEL (mg/m ³)	0.2 mg/m ³ (fume)
Yukon	OEL TWA (mg/m ³)	0.2 mg/m ³ (fume)
Aluminum (7429-90-5)		
Mexico	OEL TWA (mg/m ³)	10 mg/m ³ (fume)
USA ACGIH	ACGIH TWA (mg/m ³)	1.0 mg/m ³ (fume)
USA OSHA	OSHA PEL (TWA) (mg/m ³)	15 mg/m ³ (dust and mist) 5 mg/m ³ (fume)
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	10 mg/m ³ (dust and mist) 5 mg/m ³ (fume)
Alberta	OEL TWA (mg/m ³)	1.0 mg/m ³ (fume)
British Columbia	OEL TWA (mg/m ³)	1.0 mg/m ³ (fume)
Manitoba	OEL TWA (mg/m ³)	1.0 mg/m ³ (fume)
New Brunswick	OEL TWA (mg/m ³)	1.0 mg/m ³ (fume)
Newfoundland & Labrador	OEL TWA (mg/m ³)	1.0 mg/m ³ (fume)
Nova Scotia	OEL TWA (mg/m ³)	1.0 mg/m ³ (fume)
Nunavut	OEL TWA (mg/m ³)	1.0 mg/m ³ (fume)
Northwest Territories	OEL TWA (mg/m ³)	1.0 mg/m ³ (fume)
Ontario	OEL TWA (mg/m ³)	1.0 mg/m ³ (fume)
Prince Edward Island	OEL TWA (mg/m ³)	1.0 mg/m ³ (fume)
Québec	VEMP (mg/m ³)	1.0 mg/m ³ (fume)
Saskatchewan	OEL TWA (mg/m ³)	1.0 mg/m ³ (fume)
Antimony (7440-36-0)		
Mexico	OEL TWA (mg/m ³)	0.5 mg/m ³ (fume)
USA ACGIH	ACGIH TWA (mg/m ³)	0.5 mg/m ³ (fume)
USA OSHA	OSHA PEL (TWA) (mg/m ³)	0.5 mg/m ³ (fume)
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	50 mg/m ³ (dust and mist) 0.5 mg/m ³ (fume)
Alberta	OEL TWA (mg/m ³)	0.5 mg/m ³ (fume)
British Columbia	OEL TWA (mg/m ³)	0.5 mg/m ³ (fume)
Manitoba	OEL TWA (mg/m ³)	0.5 mg/m ³ (fume)
New Brunswick	OEL TWA (mg/m ³)	0.5 mg/m ³ (fume)
Newfoundland & Labrador	OEL TWA (mg/m ³)	0.5 mg/m ³ (fume)
Nova Scotia	OEL TWA (mg/m ³)	0.5 mg/m ³ (fume)
Nunavut	OEL TWA (mg/m ³)	0.5 mg/m ³ (fume)
Northwest Territories	OEL TWA (mg/m ³)	0.5 mg/m ³ (fume)
Ontario	OEL TWA (mg/m ³)	0.5 mg/m ³ (fume)
Prince Edward Island	OEL TWA (mg/m ³)	0.5 mg/m ³ (fume)
Québec	VEMP (mg/m ³)	0.5 mg/m ³ (fume)
Saskatchewan	OEL TWA (mg/m ³)	0.5 mg/m ³ (fume)
Arsenic (7440-38-2)		
Mexico	Unknown	Unknown
USA ACGIH	ACGIH TLV-TWA (mg/m ³)	0.01 mg/m ³ over 8 hours of work
USA ACGIH	ACGIH BEI-U (mg/m ³)	35µg/L
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	0.003 mg/m ³
USA OSHA	OSHA PEL (mg/m ³)	0.5 mg/m ³ (dust and mist) 0.01 mg/m ³ (fume)

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Canada	Unknown	Unknown
Beryllium (7440-41-7)		
Mexico	OEL TWA (mg/m ³)	0.00005 mg/m ³
USA ACGIH	ACGIH TWA (mg/m ³)	0.00005 mg/m ³
USA OSHA	OSHA PEL (TWA) (µg/m ³)	2 µg/m ³
USA OSHA	NIOSH REL (TWA) (µg/m ³)	0.00005 mg/m ³
USA NIOSH	US IDLH (mg/m ³)	0.00005 mg/m ³
USA IDLH	OEL TWA (mg/m ³)	5 µg/m ³
Alberta	OEL TWA (mg/m ³)	0.00005 mg/m ³
British Columbia	OEL TWA (mg/m ³)	2 µg/m ³ per 8 hour
Manitoba	OEL TWA (mg/m ³)	2 µg/m ³
New Brunswick	OEL STEL (mg/m ³)	0.01 mg/m ³
New Brunswick	OEL TWA (mg/m ³)	2 µg/m ³
Newfoundland & Labrador	OEL STEL (mg/m ³)	0.01 mg/m ³
Nova Scotia	OEL TWA (mg/m ³)	2 µg/m ³
Nunavut	OEL TWA (mg/m ³)	2 µg/m ³
Northwest Territories	OEL STEL (mg/m ³)	0.01 mg/m ³
Ontario	OEL TWA (mg/m ³)	0.002 mg/m ³
Ontario	OEL STEL (mg/m ³)	0.01 mg/m ³
Prince Edward Island	OEL TWA (mg/m ³)	2 µg/m ³
Québec	OEL TWA (mg/m ³)	2 µg/m ³
Saskatchewan	ACGIH TWA (mg/m ³)	2 µg/m ³
Yukon	NIOSH REL (TWA) (mg/m ³)	2 µg/m ³
Boron		
Mexico	OEL TWA (mg/m ³)	10 mg/m ³
USA ACGIH	ACGIH TLV-TWA (mg/m ³)	10 mg/m ³
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	10 mg/m ³
USA OSHA	OSHA PEL (mg/m ³)	15 mg/m ³
Canada	OEL TWA (mg/m ³)	10 mg/m ³
Cadmium (7440-43-9)		
Mexico	OEL TWA (mg/m ³)	
USA ACGIH	ACGIH TWA (mg/m ³)	
USA OSHA	OSHA PEL (TWA) (mg/m ³)	
USA OSHA	OSHA PEL (Ceiling) (mg/m ³)	0.3 mg/m ³ (fume) 0.6 mg/m ³ (dust)
USA IDLH	US IDLH (mg/m ³)	9 mg/m ³ (dust)
Alberta	OEL TWA (mg/m ³)	0.01 mg/m ³
British Columbia	OEL TWA (mg/m ³)	0.01 mg/m ³
Manitoba	OEL TWA (mg/m ³)	0.01 mg/m ³
New Brunswick	OEL TWA (mg/m ³)	0.01 mg/m ³ (inhalable fraction)
Newfoundland & Labrador	OEL TWA (mg/m ³)	0.01 mg/m ³
Nova Scotia	OEL TWA (mg/m ³)	0.01 mg/m ³
Nunavut	OEL STEL (mg/m ³)	0.2 mg/m ³ (dust)
Nunavut	OEL TWA (mg/m ³)	0.05 mg/m ³ (dust)
Northwest Territories	OEL STEL (mg/m ³)	0.2 mg/m ³ (dust)
Northwest Territories	OEL TWA (mg/m ³)	0.05 mg/m ³ (dust)
Ontario	OEL TWA (mg/m ³)	0.01 mg/m ³
Prince Edward Island	OEL TWA (mg/m ³)	0.01 mg/m ³
Québec	VEMP (mg/m ³)	0.025 mg/m ³
Saskatchewan	OEL STEL (mg/m ³)	0.03 mg/m ³ (total)
Saskatchewan	OEL TWA (mg/m ³)	0.01 mg/m ³ (total)

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Yukon	OEL STEL (mg/m ³)	0.15 mg/m ³ (dust)
Yukon	OEL TWA (mg/m ³)	0.05 mg/m ³ (dust)
Chromium (7440-47-3)		
Mexico	OEL TWA (mg/m ³)	0.5 mg/m ³
USA ACGIH	ACGIH TWA (mg/m ³)	0.5 mg/m ³
USA OSHA	OSHA PEL (TWA) (mg/m ³)	1.0 mg/m ³
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	0.5 mg/m ³
USA IDLH	US IDLH (mg/m ³)	250 mg/m ³ (dust and fume)
Canada	OEL TWA (mg/m ³)	0.5 mg/m ³
Cobalt (7440-48-4)		
Mexico	OEL TWA (mg/m ³)	0.1 mg/m ³ (dust and fume)
USA ACGIH	ACGIH TWA (mg/m ³)	0.02 mg/m ³
USA OSHA	OSHA PEL (TWA) (mg/m ³)	0.1 mg/m ³ (dust and fume)
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	0.05 mg/m ³ (dust and fume)
USA IDLH	US IDLH (mg/m ³)	20 mg/m ³ (dust and fume)
Alberta	OEL TWA (mg/m ³)	0.02 mg/m ³
British Columbia	OEL TWA (mg/m ³)	0.02 mg/m ³
Manitoba	OEL TWA (mg/m ³)	0.02 mg/m ³
New Brunswick	OEL TWA (mg/m ³)	0.02 mg/m ³
Newfoundland & Labrador	OEL TWA (mg/m ³)	0.02 mg/m ³
Nova Scotia	OEL TWA (mg/m ³)	0.02 mg/m ³
Nunavut	OEL STEL (mg/m ³)	0.3 mg/m ³ (dust and fume)
Nunavut	OEL TWA (mg/m ³)	0.1 mg/m ³ (metal-dust and fume)
Northwest Territories	OEL STEL (mg/m ³)	0.3 mg/m ³ (dust and fume)
Northwest Territories	OEL TWA (mg/m ³)	0.1 mg/m ³ (dust and fume)
Ontario	OEL TWA (mg/m ³)	0.02 mg/m ³
Prince Edward Island	OEL TWA (mg/m ³)	0.02 mg/m ³
Québec	VEMP (mg/m ³)	0.02 mg/m ³
Saskatchewan	OEL STEL (mg/m ³)	0.06 mg/m ³
Saskatchewan	OEL TWA (mg/m ³)	0.02 mg/m ³
Yukon	OEL STEL (mg/m ³)	0.15 mg/m ³ (dust and fume)
Yukon	OEL TWA (mg/m ³)	0.05 mg/m ³ (dust and fume)
Iron (1309-37-1)		
Mexico	OEL TWA (mg/m ³)	5 mg/m ³
Mexico	OEL STEL (mg/m ³)	10 mg/m ³
USA ACGIH	ACGIH TWA (mg/m ³)	5 mg/m ³ (respirable fraction)
USA OSHA	OSHA PEL (TWA) (mg/m ³)	10 mg/m ³ (fume) 15 mg/m ³ (total dust) 5 mg/m ³ (respirable fraction)
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	5 mg/m ³ (dust and fume)
USA IDLH	US IDLH (mg/m ³)	2500 mg/m ³ (dust and fume)
Alberta	OEL TWA (mg/m ³)	5 mg/m ³ (respirable)
British Columbia	OEL STEL (mg/m ³)	10 mg/m ³ (fume)
British Columbia	OEL TWA (mg/m ³)	10 mg/m ³ (total particulate matter containing no Asbestos and <1% Crystalline silica-total particulate)
Manitoba	OEL TWA (mg/m ³)	5 mg/m ³ (respirable fraction)
New Brunswick	OEL TWA (mg/m ³)	5 mg/m ³ (particulate matter containing no Asbestos and <1% Crystalline silica, dust and fume)
Newfoundland & Labrador	OEL TWA (mg/m ³)	5 mg/m ³ (respirable fraction)
Nova Scotia	OEL TWA (mg/m ³)	5 mg/m ³ (respirable fraction)
Nunavut	OEL TWA (mg/m ³)	5 mg/m ³ (respirable mass)
Northwest Territories	OEL TWA (mg/m ³)	5 mg/m ³ (respirable mass)
Ontario	OEL TWA (mg/m ³)	5 mg/m ³ (respirable)

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Prince Edward Island	OEL TWA (mg/m ³)	5 mg/m ³ (respirable fraction)
Québec	VEMP (mg/m ³)	5 mg/m ³ (dust and fume)
Saskatchewan	OEL STEL (mg/m ³)	10 mg/m ³ (dust and fume)
Saskatchewan	OEL TWA (mg/m ³)	5 mg/m ³ (dust and fume)
Yukon	OEL STEL (mg/m ³)	10 mg/m ³ (fume)
Yukon	OEL TWA (mg/m ³)	5 mg/m ³ (fume)
Lead (7439-92-1)		
Mexico	OEL TWA (mg/m ³)	0.15 mg/m ³ (dust and fume)
USA ACGIH	ACGIH TWA (mg/m ³)	0.05 mg/m ³
USA OSHA	OSHA PEL (TWA) (mg/m ³)	50 µg/m ³ (0.05 mg/m ³)
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	0.05 mg/m ³
USA IDLH	US IDLH (mg/m ³)	100 mg/m ³
Alberta	OEL TWA (mg/m ³)	0.05 mg/m ³
British Columbia	OEL TWA (mg/m ³)	0.05 mg/m ³
Manitoba	OEL TWA (mg/m ³)	0.05 mg/m ³
New Brunswick	OEL TWA (mg/m ³)	0.05 mg/m ³
Newfoundland & Labrador	OEL TWA (mg/m ³)	0.05 mg/m ³
Nova Scotia	OEL TWA (mg/m ³)	0.05 mg/m ³
Nunavut	OEL STEL (mg/m ³)	0.45 mg/m ³
Nunavut	OEL TWA (mg/m ³)	0.15 mg/m ³
Northwest Territories	OEL STEL (mg/m ³)	0.45 mg/m ³
Northwest Territories	OEL TWA (mg/m ³)	0.15 mg/m ³
Ontario	OEL TWA (mg/m ³)	0.05 mg/m ³ (designated substances regulation)
Prince Edward Island	OEL TWA (mg/m ³)	0.05 mg/m ³
Québec	VEMP (mg/m ³)	0.05 mg/m ³
Saskatchewan	OEL STEL (mg/m ³)	0.15 mg/m ³
Saskatchewan	OEL TWA (mg/m ³)	0.05 mg/m ³
Yukon	OEL STEL (mg/m ³)	0.45 mg/m ³ (dust and fume)
Yukon	OEL TWA (mg/m ³)	0.15 mg/m ³ (dust and fume)
Magnesium (7439-95-4)		
Mexico	OEL TWA (mg/m ³)	10 mg/m ³
USA ACGIH	ACGIH TWA (mg/m ³)	10 mg/m ³
USA OSHA	OSHA PEL (Ceiling) (mg/m ³)	15 mg/m ³
Canada	OEL TWA (mg/m ³)	10 mg/m ³
Manganese (7439-96-5)		
Mexico	OEL TWA (mg/m ³)	0.2 mg/m ³ 1 mg/m ³ (fume)
Mexico	OEL STEL (mg/m ³)	3 mg/m ³ (fume)
USA ACGIH	ACGIH TWA (mg/m ³)	0.02 mg/m ³ (respirable fraction) 0.1 mg/m ³ (inhalable fraction)
USA OSHA	OSHA PEL (Ceiling) (mg/m ³)	5 mg/m ³ (fume)
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	1 mg/m ³ (fume)
USA NIOSH	NIOSH REL (STEL) (mg/m ³)	3 mg/m ³
USA IDLH	US IDLH (mg/m ³)	500 mg/m ³
Alberta	OEL TWA (mg/m ³)	0.2 mg/m ³
British Columbia	OEL TWA (mg/m ³)	0.2 mg/m ³
Manitoba	OEL TWA (mg/m ³)	0.02 mg/m ³ (respirable fraction)
New Brunswick	OEL TWA (mg/m ³)	0.2 mg/m ³
Newfoundland & Labrador	OEL TWA (mg/m ³)	0.02 mg/m ³ (respirable fraction)
Nova Scotia	OEL TWA (mg/m ³)	0.02 mg/m ³ (respirable fraction)
Nunavut	OEL Ceiling (mg/m ³)	5 mg/m ³
Nunavut	OEL STEL (mg/m ³)	3 mg/m ³ (fume)
Nunavut	OEL TWA (mg/m ³)	1 mg/m ³ (fume)

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Northwest Territories	OEL Ceiling (mg/m ³)	5 mg/m ³
Northwest Territories	OEL STEL (mg/m ³)	3 mg/m ³ (fume)
Northwest Territories	OEL TWA (mg/m ³)	1 mg/m ³ (fume)
Ontario	OEL TWA (mg/m ³)	0.2 mg/m ³
Prince Edward Island	OEL TWA (mg/m ³)	0.02 mg/m ³ (respirable fraction)
Québec	VEMP (mg/m ³)	0.2 mg/m ³ (total dust and fume)
Saskatchewan	OEL STEL (mg/m ³)	0.6 mg/m ³
Saskatchewan	OEL TWA (mg/m ³)	0.2 mg/m ³
Yukon	OEL Ceiling (mg/m ³)	5 mg/m ³
Nickel (7440-02-0)		
Mexico	OEL TWA (mg/m ³)	1 mg/m ³
USA ACGIH	ACGIH TWA (mg/m ³)	1.5 mg/m ³ (inhalable fraction)
USA OSHA	OSHA PEL (TWA) (mg/m ³)	1 mg/m ³
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	0.015 mg/m ³
USA IDLH	US IDLH (mg/m ³)	10 mg/m ³
Alberta	OEL TWA (mg/m ³)	1.5 mg/m ³
British Columbia	OEL TWA (mg/m ³)	0.05 mg/m ³
Manitoba	OEL TWA (mg/m ³)	1.5 mg/m ³ (inhalable fraction)
New Brunswick	OEL TWA (mg/m ³)	1 mg/m ³
Newfoundland & Labrador	OEL TWA (mg/m ³)	1.5 mg/m ³ (inhalable fraction)
Nova Scotia	OEL TWA (mg/m ³)	1.5 mg/m ³ (inhalable fraction)
Nunavut	OEL STEL (mg/m ³)	2 mg/m ³
Nunavut	OEL TWA (mg/m ³)	1 mg/m ³
Northwest Territories	OEL STEL (mg/m ³)	2 mg/m ³
Northwest Territories	OEL TWA (mg/m ³)	1 mg/m ³
Ontario	OEL TWA (mg/m ³)	1 mg/m ³ (inhalable)
Prince Edward Island	OEL TWA (mg/m ³)	1.5 mg/m ³ (inhalable fraction)
Québec	VEMP (mg/m ³)	1 mg/m ³
Saskatchewan	OEL STEL (mg/m ³)	3 mg/m ³ (inhalable fraction)
Saskatchewan	OEL TWA (mg/m ³)	1.5 mg/m ³ (inhalable fraction)
Yukon	OEL STEL (mg/m ³)	3 mg/m ³
Yukon	OEL TWA (mg/m ³)	1 mg/m ³
Phosphorus (7723-14-0)		
USA ACGIH	ACGIH TWA (mg/m ³)	100 mg/m ³
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	0.1 mg/m ³
USA IDLH	US IDLH (mg/m ³)	5 mg/m ³
Alberta	OEL TWA (mg/m ³)	0.63 mg/m ³
British Columbia	OEL TWA (mg/m ³)	0.63 mg/m ³
Manitoba	OEL TWA (mg/m ³)	0.63 mg/m ³
New Brunswick	OEL TWA (mg/m ³)	0.63 mg/m ³
Newfoundland & Labrador	OEL TWA (mg/m ³)	0.63 mg/m ³
Nova Scotia	OEL TWA (mg/m ³)	0.63 mg/m ³
Ontario	OEL TWA (mg/m ³)	0.63 mg/m ³
Prince Edward Island	OEL TWA (mg/m ³)	0.63 mg/m ³
Québec	VEMP (mg/m ³)	0.63 mg/m ³
Saskatchewan	OEL STEL (mg/m ³)	0.63 mg/m ³
Saskatchewan	OEL TWA (mg/m ³)	0.63 mg/m ³
Selenium		
Mexico	OEL TWA (mg/m ³)	0.2 mg/m ³
USA ACGIH	ACGIH TWA (mg/m ³)	0.2 mg/m ³
USA OSHA	OSHA PEL (TWA) (mg/m ³)	0.2 mg/m ³
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	1.0 mg/m ³

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USA IDLH	US IDLH (mg/m ³)	0.2 mg/m ³
Canada	OEL TWA (mg/m ³)	0.2 mg/m ³
Silicon (7440-21-3)		
Mexico	OEL TWA (mg/m ³)	10 mg/m ³ (inhalable fraction)
Mexico	OEL STEL (mg/m ³)	20 mg/m ³
USA OSHA	OSHA PEL (TWA) (mg/m ³)	15 mg/m ³ (total dust) 5 mg/m ³ (respirable fraction)
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	10 mg/m ³ (total dust) 5 mg/m ³ (respirable dust)
British Columbia	OEL TWA (mg/m ³)	10 mg/m ³ (total dust)
New Brunswick	OEL TWA (mg/m ³)	10 mg/m ³
Nunavut	OEL TWA (mg/m ³)	5 mg/m ³ (respirable mass)
Northwest Territories	OEL TWA (mg/m ³)	5 mg/m ³ (respirable mass)
Ontario	OEL TWA (mg/m ³)	10 mg/m ³ (total dust)
Québec	VEMP (mg/m ³)	10 mg/m ³ (containing no Asbestos and <1% Crystalline silica-total dust)
Saskatchewan	OEL STEL (mg/m ³)	20 mg/m ³
Saskatchewan	OEL TWA (mg/m ³)	10 mg/m ³
Yukon	OEL STEL (mg/m ³)	20 mg/m ³
Yukon	OEL TWA (mg/m ³)	3 mg/m ³ (30 mppcf)
Silver		
Mexico	OEL TWA (mg/m ³)	0.1 mg/m ³
USA ACGIH	ACGIH TWA (mg/m ³)	0.1 mg/m ³
USA OSHA	OSHA PEL (TWA) (mg/m ³)	0.1 mg/m ³
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	0.1 mg/m ³
USA IDLH	US IDLH (mg/m ³)	10 mg/m ³
Canada	OEL TWA (mg/m ³)	0.1 mg/m ³
Sulfur (7446-09-5)		
Mexico	OEL TWA (mg/m ³)	5 mg/m ³
Mexico	OEL TWA (ppm)	2 ppm
Mexico	OEL STEL (mg/m ³)	10 mg/m ³
Mexico	OEL STEL (ppm)	5 ppm
USA ACGIH	ACGIH STEL (ppm)	0.25 ppm
USA OSHA	OSHA PEL (TWA) (mg/m ³)	13 mg/m ³
USA OSHA	OSHA PEL (TWA) (ppm)	5 ppm
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	5 mg/m ³
USA NIOSH	NIOSH REL (TWA) (ppm)	2 ppm
USA NIOSH	NIOSH REL (STEL) (mg/m ³)	13 mg/m ³
USA NIOSH	NIOSH REL (STEL) (ppm)	5 ppm
USA IDLH	US IDLH (ppm)	100 ppm
Alberta	OEL STEL (mg/m ³)	13 mg/m ³
Alberta	OEL STEL (ppm)	5 ppm
Alberta	OEL TWA (mg/m ³)	5.2 mg/m ³
Alberta	OEL TWA (ppm)	2 ppm
British Columbia	OEL STEL (ppm)	5 ppm
British Columbia	OEL TWA (ppm)	2 ppm
Manitoba	OEL STEL (ppm)	0.25 ppm
New Brunswick	OEL STEL (mg/m ³)	13 mg/m ³
New Brunswick	OEL STEL (ppm)	5 ppm
New Brunswick	OEL TWA (mg/m ³)	5.2 mg/m ³
New Brunswick	OEL TWA (ppm)	2 ppm
Newfoundland & Labrador	OEL STEL (ppm)	0.25 ppm
Nova Scotia	OEL STEL (ppm)	0.25 ppm
Nunavut	OEL STEL (mg/m ³)	13 mg/m ³

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Nunavut	OEL STEL (ppm)	5 ppm
Nunavut	OEL TWA (mg/m ³)	5 mg/m ³
Nunavut	OEL TWA (ppm)	2 ppm
Northwest Territories	OEL STEL (mg/m ³)	13 mg/m ³
Northwest Territories	OEL STEL (ppm)	5 ppm
Northwest Territories	OEL TWA (mg/m ³)	5 mg/m ³
Northwest Territories	OEL TWA (ppm)	2 ppm
Ontario	OEL STEL (mg/m ³)	10.4 mg/m ³
Ontario	OEL STEL (ppm)	5 ppm
Ontario	OEL TWA (mg/m ³)	5.2 mg/m ³
Ontario	OEL TWA (ppm)	2 ppm
Prince Edward Island	OEL STEL (ppm)	0.25 ppm
Québec	VECD (mg/m ³)	13 mg/m ³
Québec	VECD (ppm)	5 ppm
Québec	VEMP (mg/m ³)	5 mg/m ³
Québec	VEMP (ppm)	2 ppm
Saskatchewan	OEL STEL (ppm)	5 ppm
Saskatchewan	OEL TWA (ppm)	2 ppm
Yukon	OEL TWA (mg/m ³)	5 mg/m ³
Yukon	OEL TWA (ppm)	2 ppm
Yukon	OEL STEL (mg/m ³)	13 mg/m ³
Yukon	OEL STEL (ppm)	5 ppm
Tellurium		
Mexico	OEL TWA (mg/m ³)	0.1 mg/m ³
USA ACGIH	ACGIH TWA (mg/m ³)	0.1 mg/m ³
USA OSHA	OSHA PEL (TWA) (mg/m ³)	0.1 mg/m ³
USA OSHA	OSHA PEL (TWA-Vacated) (mg/m ³)	0.1 mg/m ³
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	0.1 mg/m ³
USA IDLH	US IDLH (mg/m ³)	25 mg/m ³
Canada	OEL TWA (mg/m ³)	0.1 mg/m ³
Ontario	OEL TWA EV (mg/m ³)	0.1 mg/m ³
Thallium (7440-28-0)		
USA ACGIH	ACGIH TWA (mg/m ³)	0.02 mg/m ³ (inhalable fraction)
Alberta	OEL TWA (mg/m ³)	0.1 mg/m ³
British Columbia	OEL TWA (mg/m ³)	0.02 mg/m ³ (inhalable)
Manitoba	OEL TWA (mg/m ³)	0.02 mg/m ³ (inhalable fraction)
New Brunswick	OEL TWA (mg/m ³)	0.1 mg/m ³
Newfoundland & Labrador	OEL TWA (mg/m ³)	0.02 mg/m ³ (inhalable fraction)
Nova Scotia	OEL TWA (mg/m ³)	0.02 mg/m ³ (inhalable fraction)
Ontario	OEL TWA (mg/m ³)	0.02 mg/m ³ (inhalable)
Prince Edward Island	OEL TWA (mg/m ³)	0.02 mg/m ³ (inhalable fraction)
Québec	VEMP (mg/m ³)	0.1 mg/m ³
Saskatchewan	OEL STEL (mg/m ³)	0.3 mg/m ³
Saskatchewan	OEL TWA (mg/m ³)	0.1 mg/m ³
Tin (7440-31-5)		
Mexico	OEL TWA (mg/m ³)	2 mg/m ³
Mexico	OEL STEL (mg/m ³)	4 mg/m ³
USA ACGIH	ACGIH TWA (mg/m ³)	2 mg/m ³
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	2 mg/m ³
USA IDLH	US IDLH (mg/m ³)	100 mg/m ³
Alberta	OEL TWA (mg/m ³)	2 mg/m ³

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British Columbia	OEL TWA (mg/m ³)	2 mg/m ³
Manitoba	OEL TWA (mg/m ³)	2 mg/m ³
New Brunswick	OEL TWA (mg/m ³)	2 mg/m ³
Newfoundland & Labrador	OEL TWA (mg/m ³)	2 mg/m ³
Nova Scotia	OEL TWA (mg/m ³)	2 mg/m ³
Ontario	OEL TWA (mg/m ³)	2 mg/m ³
Prince Edward Island	OEL TWA (mg/m ³)	2 mg/m ³
Québec	VEMP (mg/m ³)	2 mg/m ³
Saskatchewan	OEL STEL (mg/m ³)	4 mg/m ³
Saskatchewan	OEL TWA (mg/m ³)	2 mg/m ³
Zinc (1314-13-2)		
Mexico	OEL TWA (mg/m ³)	5 mg/m ³ (fume) 10 mg/m ³ (dust)
Mexico	OEL STEL (mg/m ³)	10 mg/m ³ (fume)
USA ACGIH	ACGIH TWA (mg/m ³)	2 mg/m ³ (respirable fraction)
USA ACGIH	ACGIH STEL (mg/m ³)	10 mg/m ³ (respirable fraction)
USA OSHA	OSHA PEL (TWA) (mg/m ³)	5 mg/m ³ (fume) 15 mg/m ³ (total dust) 5 mg/m ³ (respirable fraction)
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	5 mg/m ³ (dust and fume)
USA NIOSH	NIOSH REL (STEL) (mg/m ³)	10 mg/m ³ (fume)
USA NIOSH	NIOSH REL (ceiling) (mg/m ³)	15 mg/m ³ (dust)
USA IDLH	US IDLH (mg/m ³)	500 mg/m ³
Alberta	OEL STEL (mg/m ³)	10 mg/m ³ (respirable)
Alberta	OEL TWA (mg/m ³)	2 mg/m ³ (respirable)
British Columbia	OEL STEL (mg/m ³)	10 mg/m ³ (respirable)
British Columbia	OEL TWA (mg/m ³)	2 mg/m ³ (respirable)
Manitoba	OEL STEL (mg/m ³)	10 mg/m ³ (respirable fraction)
Manitoba	OEL TWA (mg/m ³)	2 mg/m ³ (respirable fraction)
New Brunswick	OEL STEL (mg/m ³)	10 mg/m ³ (fume)
New Brunswick	OEL TWA (mg/m ³)	10 mg/m ³ (particulate matter containing no Asbestos and <1% Crystalline silica, dust)
Newfoundland & Labrador	OEL STEL (mg/m ³)	10 mg/m ³ (respirable fraction)
Newfoundland & Labrador	OEL TWA (mg/m ³)	2 mg/m ³ (respirable fraction)
Nova Scotia	OEL STEL (mg/m ³)	10 mg/m ³ (respirable fraction)
Nova Scotia	OEL TWA (mg/m ³)	2 mg/m ³ (respirable fraction)
Nunavut	OEL STEL (mg/m ³)	10 mg/m ³ (fume)
Nunavut	OEL TWA (mg/m ³)	5 mg/m ³ (fume)
Northwest Territories	OEL STEL (mg/m ³)	10 mg/m ³ (fume)
Northwest Territories	OEL TWA (mg/m ³)	5 mg/m ³ (fume)
Ontario	OEL STEL (mg/m ³)	10 mg/m ³ (fume)
Ontario	OEL TWA (mg/m ³)	2 mg/m ³ (respirable)
Prince Edward Island	OEL STEL (mg/m ³)	10 mg/m ³ (respirable fraction)
Prince Edward Island	OEL TWA (mg/m ³)	2 mg/m ³ (respirable fraction)
Québec	VECD (mg/m ³)	10 mg/m ³ (fume)
Québec	VEMP (mg/m ³)	10 mg/m ³ (containing no Asbestos and <1% Crystalline silica-total dust)
Saskatchewan	OEL STEL (mg/m ³)	10 mg/m ³ (dust and fume, respirable fraction)
Saskatchewan	OEL TWA (mg/m ³)	2 mg/m ³ (dust and fume, respirable fraction)
Yukon	OEL STEL (mg/m ³)	10 mg/m ³ (fume)
Yukon	OEL TWA (mg/m ³)	5 mg/m ³ (fume)
Zirconium (7440-67-7)		
USA ACGIH	ACGIH TWA (mg/m ³)	5 mg/m ³
USA ACGIH	ACGIH STEL (mg/m ³)	10 mg/m ³

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USA NIOSH	NIOSH REL (TWA) (mg/m ³)	5 mg/m ³
USA NIOSH	NIOSH REL (STEL) (mg/m ³)	10 mg/m ³
USA IDLH	US IDLH (mg/m ³)	50 mg/m ³
Alberta	OEL STEL (mg/m ³)	10 mg/m ³
Alberta	OEL TWA (mg/m ³)	5 mg/m ³
British Columbia	OEL STEL (mg/m ³)	10 mg/m ³
British Columbia	OEL TWA (mg/m ³)	5 mg/m ³
Manitoba	OEL STEL (mg/m ³)	10 mg/m ³
Manitoba	OEL TWA (mg/m ³)	5 mg/m ³
New Brunswick	OEL STEL (mg/m ³)	10 mg/m ³
New Brunswick	OEL TWA (mg/m ³)	5 mg/m ³
Newfoundland & Labrador	OEL STEL (mg/m ³)	10 mg/m ³
Newfoundland & Labrador	OEL TWA (mg/m ³)	5 mg/m ³
Nova Scotia	OEL STEL (mg/m ³)	10 mg/m ³
Nova Scotia	OEL TWA (mg/m ³)	5 mg/m ³
Ontario	OEL STEL (mg/m ³)	10 mg/m ³
Ontario	OEL TWA (mg/m ³)	5 mg/m ³
Prince Edward Island	OEL STEL (mg/m ³)	10 mg/m ³
Prince Edward Island	OEL TWA (mg/m ³)	5 mg/m ³
Québec	VECD (mg/m ³)	10 mg/m ³
Québec	VEMP (mg/m ³)	5 mg/m ³
Saskatchewan	OEL STEL (mg/m ³)	10 mg/m ³
Saskatchewan	OEL TWA (mg/m ³)	5 mg/m ³

8.2. Exposure Controls

Appropriate Engineering Controls: Use local exhaust or general dilution ventilation or other suppression methods to maintain dust levels below exposure limits. Power equipment should be equipped with proper dust collection devices. Ensure all national/local regulations are observed.

Personal Protective Equipment: Protective clothing. Gloves. Safety glasses.



Dust formation: dust mask.



Insufficient ventilation: wear respiratory protection.



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Materials for Protective Clothing: Chemically resistant materials and fabrics. With molten material wear thermally protective clothing.

Hand Protection: Wear chemically resistant protective gloves. If material is hot, wear thermally resistant protective gloves.

Eye Protection: Chemical goggles or safety glasses.

Skin and Body Protection: Wear suitable protective clothing. Wash contaminated clothing before reuse.

Respiratory Protection: Use a NIOSH-approved respirator or self-contained breathing apparatus whenever exposure may exceed established Occupational Exposure Limits.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on Basic Physical and Chemical Properties

Physical State:	Solid
Appearance:	Metallic
Odor:	Odorless
Odor Threshold:	Not Available
pH:	Not Available
Evaporation Rate:	Not Available
Melting Point:	440 – 1215* F (226.7 – 657.2* C)
Freezing Point:	Not Available
Boiling Point:	Not Available
Flash Point:	Not Available
Auto-ignition Temperature:	Not Available
Decomposition Temperature:	Not Available
Flammability (solid, gas):	Not Available
Lower Flammable Limit:	Not Available
Upper Flammable Limit:	Not Available
Vapor Pressure:	Not Available
Relative Vapor Density at 20°C:	Not Available
Specific Gravity:	2.5 – 2.9
Solubility:	Insoluble in water
Partition Coefficient: N-octanol/water:	Not available
Viscosity:	Not available
Explosion Data – Sensitivity to Mechanical Impact:	Not expected to present an explosion hazard due to mechanical impact.
Explosion Data – Sensitivity to Static Discharge:	Not expected to present an explosion hazard due to static discharge.

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity

Hazardous reactions will not occur under normal conditions.

10.2. Chemical Stability

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Stable under recommended handling and storage conditions (see section 7).

10.3. Possibility of Hazardous Reactions:

Hazardous polymerization will not occur.

10.4. Conditions to Avoid

Avoid creating or spreading dust. Sparks, heat, open flame and other sources of ignition.

10.5. Incompatible Materials

When molten: water.

Normal conditions: Strong acids, strong bases, strong oxidizers, alkalis, metal oxides, moisture. Corrosive substances in contact with metals may produce flammable hydrogen gas.

10.6. Hazardous Decomposition Products

Oxides of iron and carbon. Organic acid vapors. Oxides of lead. Chromium (VI) compounds.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on Toxicological Effects of Product and Components

11.1.1. Product:

Acute Toxicity: Not Classified.

LD50 and LC50 Data: Not available.

Skin Corrosion/Irritation: Not classified.

Serious Eye Damage/Irritation: Not classified.

Respiratory or Skin Sensitization: Not classified. Not classified.

Germ Cell Mutagenicity: Not classified.

Teratogenicity: Not classified.

Carcinogenicity: Not classified.

Specific Target Organ Toxicity (Repeated Exposure): Not classified.

Reproductive Toxicity: Not classified.

Specific Target Organ Toxicity (Single Exposure): Not classified.

Aspiration Hazard: Not classified.

11.1.2. Components:

COMPONENT	LD50 ORAL	LD50 DERMAL	LD50 INAHATION	OTHER
Copper	3.5 mg/kg Oral-Mouse	375 mg/kg Rabbit	No data	Respiratory irritant
Aluminum	No data	No data	>1000 mg/m ³ Rat	Mild skin / eye irritant
Antimony	7 g/kg Oral – Rat	No data	No data	No data
Arsenic	763 mg/kg Oral-Rat	No data	0.50 mg/l (4h)	No data
Beryllium	18-200 mg/kg Oral-Rat	No data	>0.8 mg/m ³ Rat	Skin irritant
Bismuth	5 g/kg Oral – Rat	No data	No data	No data
Boron	642 mg/kg Oral – Rat	150 mg/kg Rat	No data	No data
Cadmium	100-300 mg/kg Oral-Rat	No data	25 mg/m ³ Rat (.5h)	No data
Chromium	No data	No data	No data	No data
Cobalt	6.171 g/kg Oral-Rat	No data	165 mg/m ³	Respiratory irritant
Iron Oxide	> 10,000 mg/kg Oral-Rat	No data	No data	Eye irritant
Lead	500 mg/kg body weight	No data	No data	Dust: 1.50 mg/l/4h
Magnesium	No data	No data	No data	No data
Manganese	> 2,000 mg/kg Oral-Rat	No data	No data	Mild skin / eye irritant
Nickel	>5 g/kg Oral-Rat	>7.5 g/kg Rabbit	12 mg/kg Rat	No data
Phosphorus	4820 ug/kg Oral-Mouse 380 mg/kg Oral-Rat	No Data	31.4 ppm Rat (4 h)	No data
Selenium	6700 mg/kg Oral – Rat	No data	No data	No data

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Silicon	3.16 g/kg Oral-Rat	No data	No data	Eye, skin, respiratory irritant
Silver	No data	No data	No data	No data
Sulfur dioxide	No data	No data	2500 ppm Rat (1h)	No data
Tellurium	>5000 mg/kg Oral – Rat	No data	2420 mg/m3 Rat (4 h)	No data
Thallium	32-39 mg/kg Oral-Rat	No data	No data	Causes hair loss and nerve damage if ingested
Tin	2,000 mg/kg Gastro-Human	No data	No data	No data
Titanium	No data	No data	No data	No data
Zinc oxide	> 5,000 mg/kg Oral-Rat	> 2000 mg/kg Rat	No data	Eye irritant
Zirconium	No data	No data	No data	No data

11.2. Symptoms Related to the Physical, Chemical and Toxicological Characteristics

Symptoms/Injuries after Inhalation: Inhalation of dusts and fumes can cause metal fume fever. Symptoms can include a metallic or sweet taste in the mouth, sweating, shivering, headache, throat irritation, fever, chills, thirstiness, muscle aches, nausea, vomiting, weakness, fatigue, and shortness of breath.

Symptoms/Injuries after Skin Contact: May cause an allergic skin reaction. Dust from physical alteration of this product causes skin irritation. Causes severe skin burns. Contact with fumes or metal powder will irritate skin. Contact with hot, molten metal will cause thermal burns. Dust may cause irritation in skin folds or by contact in combination with tight clothing. Mechanical damage via flying particles and chipped slag is possible.

Symptoms/Injuries after Eye Contact: Dust may cause mechanical irritation to eyes, nose, throat, and lungs.

Symptoms/Injuries after Ingestion: Ingestion is likely to be harmful or have adverse effects.

11.3. Effects and Chronic Effects from Short and Long Term Exposure

Effects: In massive form, no hazard exists.

Chronic Effects: In massive form, no hazard exists. If physically altered to present slivers, ribbons, dusts or fumes from molten material: **Aluminum:** Inhalation of finely divided aluminum powder may cause pulmonary fibrosis. Inhalation of iron oxide fumes undergoing decomposition may cause irritation and flu-like symptoms, otherwise iron oxide is not hazardous. **Nickel:** May cause a form of dermatitis known as nickel itch and intestinal irritation, which may cause disorders, convulsions and asphyxia. Inhalation of Nickel compounds has been shown in studies to provide an increased incidence of cancer of the nasal cavity, lung and possibly larynx in nickel refinery workers. **Zinc:** Prolonged exposure to high concentrations of zinc fumes may cause "zinc shakes", an involuntary twitching of the muscles. Otherwise, zinc is non-toxic. **Manganese:** Chronic exposure can cause inflammation of the lung tissue, scarring the lungs (pulmonary fibrosis). **Copper:** Overexposure to fumes may cause metal fume fever (chills, muscle aches, nausea, fever, dry throat, cough, weakness, and lassitude); metallic or sweet taste; discoloration of skin and hair. Tissue damage of mucous membranes may follow chronic dust exposure. **Silicon:** Can cause chronic bronchitis and narrowing of the airways. **Lead:** Exposure can result in lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; encephalopathy; kidney disease; hypertension. May cause genetic defects. May damage fertility. May damage the unborn child. **Beryllium:** Over time inhalation of dust and fumes from this product in certain individuals may cause Chronic Beryllium Disease. This causes allergic reactions in sensitized individuals in the lungs, possibly resulting in pulmonary fibrosis, and can even be fatal. Beryllium is a known carcinogen. Take appropriate precautions for workers exposure to Beryllium compounds, avoid breathing dust, and fumes from this product. **Tin:** Has been shown to increase incidence of sarcoma in animal tests. Chronic exposure to tin dusts and fume may result in "stannosis", a mild form of pneumoconiosis.

IARC of Components:

Component	IARC	National Toxicity Program (NTP) Status
Copper	3	Not Classified as a Human Carcinogen
Aluminum	1	Known Human Carcinogens.

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Antimony	3	Not Classified as a Human Carcinogen
Arsenic	1	Known Human Carcinogens.
Beryllium	1	Known Human Carcinogens.
Bismuth	3	Not Classified as a Human Carcinogen
Boron	3	Not Classified as a Human Carcinogen
Cadmium	1	Known Human Carcinogens.
Chromium	3	Not Classified as a Human Carcinogen
Cobalt	2B	Possibly carcinogenic to Humans.
Iron Oxide	3	Not Classified as a Human Carcinogen
Lead	2A	Reasonably anticipated to be Human Carcinogen.
Magnesium	3	Not Classified as a Human Carcinogen
Manganese	3	Not Classified as a Human Carcinogen
Nickel	2B	Reasonably anticipated to be Human Carcinogen.
Phosphorus	3	Not Classified as a Human Carcinogen
Selenium	3	Not Classified as a Human Carcinogen
Silicon	3	Not Classified as a Human Carcinogen
Silver	3	Not Classified as a Human Carcinogen
Sulfur dioxide	3	Not Classified as a Human Carcinogen
Tellurium	3	Not Classified as a Human Carcinogen
Thallium	3	Not Classified as a Human Carcinogen
Tin	3	Not Classified as a Human Carcinogen
Titanium	3	Not Classified as a Human Carcinogen
Zinc oxide	3	Not Classified as a Human Carcinogen
Zirconium	3	Not Classified as a Human Carcinogen

SECTION 12: ECOLOGICAL INFORMATION

12.1 Ecological Toxicity

Substance:

No data available for copper & alloys in their natural solid state. However, individual components of the material have been found to be toxic to the environment. Metal dusts may migrate into soil and groundwater and be ingested by wildlife.

Components:

Copper (7440-50-8)	
LC50 - Pimephales promelas	<= 0.0068 (0.0068 - 0.0156) mg/l (Exposure time: 96 h)
EC50 - Daphnia magna	0.03 mg/l (Exposure time: 48 h)
EC50 - Pseudokirchneriella subcapitata	0.0426 (0.0426 - 0.0535) mg/l (Exposure time: 72 h)
LC50 - Pimephales promelas	0.3 mg/l (Exposure time: 96)
EC50 - Pseudokirchneriella subcapitata	0.031 (0.031 - 0.054) mg/l (Exposure time: 96 h)
Aluminum (7429-90-5)	
LC50 - Fish: Ctenopharyngodon idella	260 ug/l (Exposure time: 96 h)
LC50 - Crustacea	2.6 mg/l (Exposure time: 24 h)
LC50 -Oncorhynchus mykiss	120 ug/l (Exposure time: 96 h)
Antimony (7440-36-0)	
LC50 – Fish Cyprinodon variegatus	6.2 – 8.3 mg/l (Exposure time: 96 h)
Arsenic (7440-38-2)	
EC50 - Daphnia magna	3.8 mg/l (Exposure time: 48 h)
LC50 - Pimephales promelas	9.9 mg/l (Exposure time: 96 h)
Beryllium (7440-41-7)	
Insufficient data	
Bismuth (7440-69-9)	

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Insufficient data	
Boron (7440-42-8)	
Insufficient data	
Cadmium (7440-43-9)	
LC50 - Oncorhynchus mykiss	0.003 mg/l (Exposure time: 96 h)
EC50 - Daphnia magna	0.0244 mg/l (Exposure time: 48 h)
Chromium (7440-47-3)	
LC50 - Cyprinus carpio	14.3 mg/l (Exposure time: 96 h)
EC50 - Daphnia magna	0.07 mg/l (Exposure time: 48 h)
Cobalt (7440-48-4)	
LC50 - Danio Rerio	100.01 mg/l (Exposure time 96h)
LC50 - Brachydanio rerio	100 mg/l (Exposure time: 96 h)
Iron oxide (1309-37-1)	
Not known to be hazardous to water or waterborne life forms	
Lead (7439-92-1)	
LD50 - Coturnix japonica	>5,000 ppm (Exposure time 5d)
LC50 - Cyprinus carpio	0.44 mg/l (Exposure time: 96 h)
EC50 - water flea	600 µg/l (Exposure time: 48 h)
LC 50 - Oncorhynchus mykiss	1.17 mg/l (Exposure time: 96 h)
Magnesium (7439-95-4)	
Insufficient data	
Manganese (7439-96-5)	
EC50 - Daphnia magna	40 mg/l (Exposure time 48 h)
NOEC chronic fish Oncorhynchus mykiss	3.6 mg/l (Exposure time: 96h)
Nickel (7440-02-0)	
LC50 - Cyprinus carpio	1.3 mg/l (Exposure time 96 h)
EC50 - Daphnia magna	1 mg/l (Exposure time 48 h)
LC50 - Brachydanio rerio	100 mg/l (Exposure time: 96 h)
EC50 - Ceriodaphnia dubia	13 (13 - 200) µg/l (Exposure time: 48h)
EC50 - Pseudokirchneriella subcapitata	0.174 (0.174 - 0.311) mg/l (Exposure time: 96 h)
Phosphorus (7723-14-0)	
LC50 - Danio rerio	33.2 mg/l (Exposure time 96 h)
EC50 - Daphnia magna	10.5 mg/l (Exposure time 48 h)
EC50 - Desmodesmus subspicatus	18.3 mg/l (Exposure time 72 h)
EC50 - Sludge Treatment	> 1,000 mg/l (Exposure time 3 h)
Selenium (7782-49-2)	
LC50 - Daphnia magna	0.43 mg/l (Exposure time 48 h)
EC50 - Pseudokirchneriella subcapitata	99 mg/l (Exposure time 72 h)
Mortality NOEC - Cyprinodon variegatus	2 mg/l (Exposure time 96 h)
Mortality LOEC - Oncorhynchus mykiss	7.8 mg/l (Exposure time 96 h)
Silicon (7440-21-3)	
Insufficient data	
Sulfur dioxide (7446-09-5)	
EC50 - Brevoortia tyrannus	3000 ug/L (Exposure time 0.667-0.833 hour)
EC50 - Rhizoclonium hieroglyphicum	500 ug/L (Exposure time 6 day)
EC50 - Lemna minor	150 ug/L Exposure time NR hour)
Tellurium (13494-80-9)	
LC50 - Pimephales promelas	37.1 mg/l (Exposure time 96 h)
EC50 - Daphnia magna	5.79 mg/l (Exposure time 48 h)
EC50 – Fresh Water Algae	11.7 mg/L
LC50 – Fresh Water Algae	11.7 mg/L
Thallium (7440-28-0)	

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LC50 - Cyprinodon variegatus	21 mg/l (Exposure time 96 h)
mortality NOEC	14 mg/l (Exposure time 96 h)
Tin (7440-31-5)	
Not known to be hazardous to water or waterborne life forms	
Titanium (7440-32-6)	
Not known to be hazardous to water or waterborne life forms	
Zinc oxide (1314-13-2)	
LC50 - Pimephales promelas	780 µg/l (Exposure time: 96 h)
LC50 - Oncorhynchus mykiss	1.1 mg/l (Exposure time 96 h)
EC50 - Ceriodaphnia dubia	0.122 mg/l
EC50 - Daphnia magna	0.098 mg/l (Exposure time 48 h)
NOEC - Jordanella floridae	0.026 mg/l
Zirconium (7440-67-7)	
Insufficient data	

12.2. Persistence and Degradability

Persistence of Copper Alloys: Not established. Not readily biodegradable.

Copper and Copper Alloy	
Persistence and Degradability	Not established / Not readily biodegradable

Persistence of Components: Not established. Not readily biodegradable.

12.3. Bioaccumulative Potential

Bioaccumulative of Copper Alloy: Not Established.

Bioaccumulative of Components:

Copper (7440-50-8)	
Bioaccumulative Potential	No data available
Aluminum (7429-90-5)	
Bioaccumulative Potential	No data available
Antimony (7440-36-0)	
Bioaccumulative Potential	No data available
Arsenic (7440-38-2)	
Bioaccumulative Potential	No data available
Beryllium (7440-41-7)	
Bioaccumulative Potential	No data available
Bismuth (7440-69-9)	
Bioaccumulative Potential	No data available
Boron (7440-42-8)	
Bioaccumulative Potential	No data available
Cadmium (7440-43-9)	
Bioaccumulative Potential	Oncorhynchus mykiss (rainbow trout) - 72 d - 1.27 µg/l
Bioconcentration factor (BCF)	55
Chromium (7440-47-3)	
Bioaccumulative Potential	Oncorhynchus mykiss (rainbow trout) - 30 d - 50 µg/l
Bioconcentration factor (BCF)	1.03 – 1.22
Cobalt (7440-48-4)	
Bioaccumulative Potential	No data available
Iron oxide (1309-37-1)	
Bioaccumulative Potential	No data available
Lead (7439-92-1)	
Bioaccumulative Potential	No data available
Magnesium (7439-95-4)	
Bioaccumulative Potential	No data available

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Manganese (7439-96-5)	
Bioaccumulative Potential	No data available
Nickel (7440-02-0)	
Bioaccumulative Potential	No data available
Phosphorus (7723-14-0)	
Bioaccumulative Potential	No data available
Silicon (7440-21-3)	
Bioaccumulative Potential	No data available
Selenium (7782-49-2)	
Bioaccumulative Potential	Lepomis macrochirus - 60 d - 640 µg/l
Bioconcentration factor (BCF)	7.7
Silver (7440-22-4)	
Bioaccumulative Potential	No data available
Sulfur dioxide (7446-09-5)	
Bioaccumulative Potential	No data available
Tellurium (13494-80-9)	
Bioaccumulative Potential	No data available
Thallium (7440-28-0)	
Bioaccumulative Potential	No data available
Tin (7440-31-5)	
Bioaccumulative Potential	No data available
Titanium (7440-32-6)	
Bioaccumulative Potential	No data available
Zinc oxide (1314-13-2)	
Bioaccumulative Potential	No data available
Zirconium (7440-67-7)	
Bioaccumulative Potential	No data available

12.4 Mobility in Soil

No data available

12.5 Other Adverse Effects

Other: Avoid release to the environment.

SECTION 13: DISPOSAL INFORMATION

13.1. Waste Treatment Methods

Waste Treatment Methods: Recycle product when possible, otherwise, dispose in accordance with local, state, and federal regulations.

SECTION 14: TRANSPORTATION INFORMATION

14.1. UN Number

In Accordance with DOT: Not regulated for transport.

14.2. UN Proper Shipping Name

In Accordance with IMDG: Not regulated for transport.

14.3. Transport Hazard Class(es)

In Accordance with IATA: Not regulated for transport.

14.4. Packing Group

In Accordance with TDG: Not regulated for transport.

14.5. Environmental Hazards

Marine Pollutant: No.

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14.6. Transport in bulk

In Accordance to Annex II of MARPOL 73/78 and the IBC Code: Not regulated for transport.

14.7. Special Precautions

In Connection with the transport or conveyance: None.

SECTION 15: REGULATORY INFORMATION

15.1. Safety, Health, and Environmental Regulations

Product:

Copper / Copper Alloys	
SARA Section 311/312 Hazard Classes	Delayed (chronic) health hazard
Components:	
Copper (7440-50-8)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313	
SARA Section 313 - Emission Reporting	1.0 %
Aluminum (7429-90-5)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313	
SARA Section 313 - Emission Reporting	1.0 % (dust or fumes only)
Antimony (7440-36-0)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313	
SARA Section 313 - Emission Reporting	1.0 % (dust or fumes only)
Arsenic (7440-38-2)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313	
SARA Section 313 - Emission Reporting	0.1 %
Beryllium (7440-41-7)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313	
SARA Section 311/312 – Hazardous Chemicals	1 curie final RQ; 0.037 TBq final RQ
SARA Section 313 - Emission Reporting	0.1 %
Bismuth (7440-69-9)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313	
Boron (7440-42-8)	
Not listed on the United States TSCA	
Cadmium (7440-43-9)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313	
SARA Section 313 - Emission Reporting	0.1 %
Chromium (7440-47-3)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313	
SARA Section 311/312 – Hazardous Chemicals	RQ 5,000 lbs.
Cobalt (7440-48-4)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313	
SARA Section 313 - Emission Reporting	0.1 %
Iron oxide (1309-37-1)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
Lead (7439-92-1)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313	
SARA Section 313 - Emission Reporting	0.1 %
Magnesium (7439-95-4)	
Not listed on the United States TSCA	
Manganese (7439-96-5)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313	
SARA Section 313 - Emission Reporting	1.0 %

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Nickel (7440-02-0)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313	
RQ (Reportable Quantity, Section 304 of EPA's List of Lists):	100 lb (only applicable if particles are <100 µm)
SARA Section 313 - Emission Reporting	0.1 %
Phosphorus (7723-14-0)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 302	
RQ (Reportable Quantity, Section 302 of EPA's List of Lists):	100 lb (only applicable if particles are <100 µm)
SARA Section 313 - Emission Reporting	0.1 %
Selenium (7782-49-2)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313	
SARA 313 – Threshold Values %	1.0
Silicon (7440-21-3)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
Silver (7440-22-4)	
Not listed on the United States TSCA	
Sulfur dioxide (7446-09-5)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on the United States SARA Section 302	
SARA Section 302 Threshold Planning Quantity (TPQ)	500
Tellurium (13494-80-9)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 355	
Thallium (7440-28-0)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313	
SARA Section 313 - Emission Reporting	1.0 %
Tin (7440-31-5)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
Titanium (7440-32-6)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
Zinc oxide (1314-13-2)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
Zirconium (7440-67-7)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	

15.2. US State Regulations Components

Copper (7440-50-8)
U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List U.S. - Pennsylvania - RTK (Right to Know) List
Aluminum (7429-90-5)
U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List U.S. - Pennsylvania - RTK (Right to Know) List
Antimony (7440-36-0)
U.S. - Massachusetts - Right To Know List U.S. – Illinois – Right to know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List U.S. – Rhode Island – Right to Know List
Arsenic (7440-38-2)

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U.S. - Massachusetts - Right To Know List	
U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List	
U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances	
U.S. - Pennsylvania - RTK (Right to Know) List	
U.S. - California - Proposition 65 - Carcinogens List	WARNING: This product contains chemicals known to the State of California to cause cancer.
Beryllium (7440-41-7)	
U.S. - Florida - Right to Know List	
U.S. - Massachusetts - Right To Know List	
U.S. - Minnesota - Right to Know List	
U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List	
U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances	
U.S. - Pennsylvania - RTK (Right to Know) List	
U.S. - California - Proposition 65 - Carcinogens List	WARNING: This product contains chemicals known to the State of California to cause cancer.
Bismuth (7440-69-9)	
Not listed	
Boron (7440-42-8)	
U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) List	
Cadmium (7440-43-9)	
U.S. - Massachusetts - Right To Know List	
U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List	
U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances	
U.S. - Pennsylvania - RTK (Right to Know) List	
U.S. - California - Proposition 65 - Carcinogens List	WARNING: This product contains chemicals known to the State of California to cause cancer.
U.S. - California - Proposition 65 - Developmental Toxicity	WARNING: This product contains chemicals known to the State of California to cause birth defects.
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	WARNING: This product contains chemicals known to the State of California to cause (Male) reproductive harm.
Chromium (7440-47-3)	
U.S. - California - Right To Know List	
U.S. - Massachusetts - Right To Know List	
U.S. - Minnesota - Right To Know List	
U.S. - New Jersey - Right To Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) List	
Cobalt (7440-48-4)	
U.S. - Massachusetts - Right To Know List	
U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List	
U.S. - Pennsylvania - RTK (Right to Know) List	
U.S. - California - Proposition 65 - Carcinogens List	WARNING: This product contains chemicals known to the State of California to cause cancer.
Iron oxide (1309-37-1)	
U.S. - Massachusetts - Right To Know List	
U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) List	
Lead (7439-92-1)	
U.S. - Massachusetts - Right To Know List	

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U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List	
U.S. - Pennsylvania - RTK (Right to Know) List	
U.S. - California - Proposition 65 - Carcinogens List	WARNING: This product contains chemicals known to the State of California to cause cancer.
U.S. - California - Proposition 65 - Developmental Toxicity	WARNING: This product contains chemicals known to the State of California to cause birth defects.
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	WARNING: This product contains chemicals known to the State of California to cause (Female) reproductive harm.
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	WARNING: This product contains chemicals known to the State of California to cause (Male) reproductive harm.
Magnesium (7439-95-4)	
U.S. - California - Right To Know List	
U.S. - Massachusetts - Right To Know List	
U.S. - New Jersey - Right To Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) List	
Manganese (7439-96-5)	
U.S. - Massachusetts - Right To Know List	
U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List	
U.S. - Pennsylvania - RTK (Right to Know) List	
Nickel (7440-02-0)	
U.S. - Massachusetts - Right To Know List	
U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List	
U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances	
U.S. - Pennsylvania - RTK (Right to Know) List	
U.S. - California - Proposition 65 - Carcinogens List	WARNING: This product contains chemicals known to the State of California to cause cancer.
Phosphorus (7723-14-0)	
U.S. - Massachusetts - Right To Know List	
U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) List	
Selenium (7782-49-2)	
U.S. - Massachusetts - Right To Know List	
U.S. - Michigan - Critical Material	
U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - New York - Release Reporting List	
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List	
U.S. - Rhode Island - Right to Know list	
Silicon (7440-21-3)	
U.S. - Massachusetts - Right To Know List	
U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) List	
Silver (7440-22-4)	
U.S. - California - Right To Know List	
U.S. - Massachusetts - Right To Know List	
U.S. - Minnesota - Right to Know List	
U.S. - New Jersey - Right to Know List	
U.S. - Pennsylvania - RTK (Right to Know)	
Sulfur dioxide (7446-09-5)	
U.S. - Massachusetts - Right To Know List	
U.S. - New Jersey - Right to Know Hazardous Substance List	

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U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List	
U.S. - Pennsylvania - RTK (Right to Know) List	
U.S. - California - Proposition 65 - Developmental Toxicity	WARNING: This product contains chemicals known to the State of California to cause birth defects.
Tellurium (13494-80-9)	
U.S. - Massachusetts - Right To Know Component List	
U.S. - New Jersey - Right to Know Component List	
U.S. - Pennsylvania - RTK (Right to Know) Component List	
U.S. - Rhode Island - Right To Know List	
Thallium (7440-28-0)	
U.S. - Massachusetts - Right To Know List	
U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List	
U.S. - Pennsylvania - RTK (Right to Know) List	
Tin (7440-31-5)	
U.S. - Massachusetts - Right To Know List	
U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) List	
Titanium (7440-32-6)	
U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List	
Zinc oxide (1314-13-2)	
U.S. - Massachusetts - Right To Know List	
U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List	
U.S. - Pennsylvania - RTK (Right to Know) List	
Zirconium (7440-67-7)	
U.S. - Massachusetts - Right To Know List	
U.S. - New Jersey - Right to Know Hazardous Substance List	
U.S. - Pennsylvania - RTK (Right to Know) List	

15.3. Canadian Regulations

Product

Copper/Copper Alloys	
WHMIS Classification	Uncontrolled product according to WHMIS classification criteria

Components

Copper (7440-50-8)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 1 %	
WHMIS Classification	Uncontrolled product according to WHMIS classification criteria
Aluminum (7429-90-5)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 1 %	
WHMIS Classification	Class B Division 6 - Reactive Flammable Material Class B Division 4 - Flammable Solid
Antimony (7440-36-0)	
Listed on the Canadian CPR (Controlled Products Regulations)	
IDL Concentration 1 %	
WHMIS Classification	Class D Division 2 Subdivision A - Very toxic material causing other toxic effects

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Arsenic (7440-38-2)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 0.1 %	
WHMIS Classification	Class D Division 1 Subdivision A - Very toxic material causing immediate and serious toxic effects Class D Division 2 Subdivision A - Very toxic material causing other toxic effects
Beryllium (7440-41-7)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 0.1 %	
WHMIS Classification	Class D Division 2 Subdivision A - Very toxic material causing other toxic effects Class D Division 2 Subdivision B - Toxic material causing other toxic effects
Bismuth (7440-69-9)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 0.1 %	
WHMIS Classification	Class B4 Flammable solid
Cadmium (7440-43-9)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 0.1 %	
WHMIS Classification	Class D Division 1 Subdivision A - Very toxic material causing immediate and serious toxic effects Class D Division 2 Subdivision A - Very toxic material causing other toxic effects
Chromium (7440-47-3)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 0.1 %	
WHMIS Classification	Uncontrolled product according to WHMIS classification criteria
Cobalt (7440-48-4)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 0.1 %	
WHMIS Classification	Class D Division 2 Subdivision A - Very toxic material causing other toxic effects Class D Division 2 Subdivision B - Toxic material causing other toxic effects
Iron oxide (1309-37-1)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 1 %	
WHMIS Classification	Uncontrolled product according to WHMIS classification criteria
Lead (7439-92-1)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 0.1 %	
WHMIS Classification	Class D Division 2 Subdivision A - Very toxic material causing other toxic effects
Magnesium (7439-95-4)	
Listed on the Canadian DSL (Domestic Substances List)	
WHMIS Classification	Class B Division 4 - Flammable Solid
Manganese (7439-96-5)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 1 %	
WHMIS Classification	Uncontrolled product according to WHMIS classification criteria

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Nickel (7440-02-0)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 0.1 %	
WHMIS Classification	Class D Division 2 Subdivision B - Toxic material causing other toxic effects
Phosphorus (7723-14-0)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 1 %	
WHMIS Classification	Uncontrolled product according to WHMIS classification criteria
Selenium (7782-49-2)	
Listed on the Canadian DSL (Domestic Substances List)	
Silicon (7440-21-3)	
Listed on the Canadian DSL (Domestic Substances List)	
WHMIS Classification	Uncontrolled product according to WHMIS classification criteria
Sulfur dioxide (7446-09-5)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 1 %	
WHMIS Classification	Class A - Compressed Gas Class D Division 1 Subdivision A - Very toxic material causing immediate and serious toxic effects Class D Division 2 Subdivision B - Toxic material causing other toxic effects Class E - Corrosive Material
Silver (7440-22-4)	
Listed on the Canadian DSL (Domestic Substances List)	
WHMIS Classification	Class D Division 2 Subdivision A - Very toxic material
Tellurium (13494-80-9)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
WHMIS Classification	Class D Division 1 Subdivision B
Thallium (7440-28-0)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 1 %	
WHMIS Classification	Class D Division 2 Subdivision A - Very toxic material causing other toxic effects
Tin (7440-31-5)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 1 %	
WHMIS Classification	Uncontrolled product according to WHMIS classification criteria
Titanium (7440-32-6)	
Listed on the Canadian DSL (Domestic Substances List)	
Zinc oxide (1314-13-2)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 1 %	
WHMIS Classification	Uncontrolled product according to WHMIS classification criteria
Zirconium (7440-67-7)	
Listed on the Canadian DSL (Domestic Substances List)	
Listed on the Canadian IDL (Ingredient Disclosure List)	
IDL Concentration 1 %	
WHMIS Classification	Uncontrolled product according to WHMIS classification criteria

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This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all of the information required by CPR.

15.4. Mexican Regulations

Product: This safety data sheet was prepared in accordance with the Official Mexican Standard (NOM-018-STPS-2000).

SECTION 16: OTHER INFORMATION

16.1. Revision Date

Date of Revision: November 16, 2015

16.2. Standards

In Accordance: This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

16.3. Responsibility

Party Responsible for the Preparation of this Document

Millard Wire & Specialty Strip Co.

449 Warwick Industrial Drive

Warwick, Rhode Island 02886

TEL: 401-737-9330

16.4. NFPA Rating



GHS Full Text Phrases:

Acute Tox. 1 (Inhalation:dust,mist)	Acute toxicity (inhalation: dust, mist) Category 1
Acute Tox. 2 (Inhalation)	Acute toxicity (inhalation) Category 2
Acute Tox. 2 (Inhalation:dust,mist)	Acute toxicity (inhalation:dust,mist) Category 2
Acute Tox. 2 (Oral)	Acute toxicity (oral) Category 2
Acute Tox. 3 (Inhalation:dust,mist)	Acute toxicity (inhalation:dust,mist) Category 3
Acute Tox. 3 (Inhalation:gas)	Acute toxicity (inhalation:gas) Category 3
Acute Tox. 3 (Oral)	Acute toxicity (oral) Category 3
Acute Tox. 4 (Inhalation:dust,mist)	Acute toxicity (inhalation:dust,mist) Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Aquatic Acute 1	Hazardous to the aquatic environment - Acute Hazard Category 1
Aquatic Acute 3	Hazardous to the aquatic environment - Acute Hazard Category 3
Aquatic Chronic 1	Hazardous to the aquatic environment - Chronic Hazard Category 1
Aquatic Chronic 3	Hazardous to the aquatic environment - Chronic Hazard Category 3
Aquatic Chronic 4	Hazardous to the aquatic environment - Chronic Hazard Category 4
Carc. 1A	Carcinogenicity Category 1A
Carc. 1B	Carcinogenicity Category 1B
Carc. 2	Carcinogenicity Category 2
Comb. Dust	Combustible Dust
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Flam. Sol. 1	Flammable solids Category 1
Repr. 1A	Reproductive toxicity Category 1A

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Repr. 1B	Reproductive toxicity Category 1B
Repr. 2	Reproductive toxicity Category 2
Resp. Sens. 1B	Respiratory sensitisation Category 1B
Skin Corr. 1B	Skin corrosion/irritation Category 1B
Skin Sens. 1	Skin sensitization Category 1
Skin Sens. 1B	Skin sensitization Category 1B
STOT RE 1	Specific target organ toxicity (repeated exposure) Category 1
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
Water-react. 2	Substances and mixtures which in contact with water emit flammable gases Category 2
H228	Flammable solid - May form combustible dust concentrations in air
H261	In contact with water releases flammable gases
H280	Contains gas under pressure; may explode if heated
H300	Fatal if swallowed
H301	Toxic if swallowed
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H317	May cause an allergic skin reaction
H318	Causes serious eye damage
H319	Causes serious eye irritation
H330	Fatal if inhaled
H331	Toxic if inhaled
H332	Harmful if inhaled
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled
H340	May cause genetic defects
H341	Suspected of causing genetic defects
H350	May cause cancer
H351	Suspected of causing cancer
H360	May damage fertility or the unborn child
H361	Suspected of damaging fertility or the unborn child
H372	Causes damage to organs through prolonged or repeated exposure
H373	May cause damage to organs through prolonged or repeated exposure
H400	Very toxic to aquatic life
H402	Harmful to aquatic life
H410	Very toxic to aquatic life with long lasting effects
H412	Harmful to aquatic life with long lasting effects
H413	May cause long lasting harmful effects to aquatic life

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.