

SECTION 1: IDENTIFICATION

1.1. Product Identifier

Product Form: Mixture

Product Name: Stainless Steels

Synonyms: Bar, Sheet, Plate, Tubing, Pipe, Structural

1.2. Intended Use of the Product

Solid Product, Various Forms and Uses.

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

Company

Joseph T. Ryerson & Son, Inc.

227 W Monroe St., 27th Floor

Chicago, Illinois 60606

T (312) 292-5000

www.ryerson.com

1.4. Emergency Telephone Number

Emergency Number : CHEMTREC (US Transportation): (800) 424-9300 CANUTEC (Canadian Transportation): (613) 996-6666
For Chemical Emergency, Spill, Leak, Fire, Exposure, or Accident, call CHEMTREC – Day or Night

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the Substance or Mixture

GHS-US/CA Classification

Skin Sens. 1 H317

Carc. 1B H350

Repr. 1B H360

Full text of hazard classes and H-statements : see Section 16.

2.2. Label Elements

GHS-US/CA Labeling

Hazard Pictograms (GHS-US/CA)



Signal Word (GHS-US/CA)

: Danger

Hazard Statements (GHS-US/CA)

: H317 - May cause an allergic skin reaction.
H350 - May cause cancer.
H360 - May damage fertility or the unborn child.

Precautionary Statements (GHS-US/CA)

: P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P261 - Avoid breathing fume, dust.
P272 - Contaminated work clothing should not be allowed out of the workplace.
P280 - Wear protective gloves, protective clothing, and eye protection.
P302+P352 - IF ON SKIN: Wash with plenty of water.
P308+P313 - If exposed or concerned: Get medical advice/attention.
P321 - Specific treatment (see Section 4 on this SDS).
P333+P313 - If skin irritation or rash occurs: Get medical advice/attention.
P362+P364 - Take off contaminated clothing and wash it before reuse.
P405 - Store locked up.
P501 - Dispose of contents/container in accordance with local, regional, national, territorial, provincial, and international regulations.

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2.3. Other Hazards

This product as shipped is physiologically inert in its solid form. However, user-generated dust and/or fumes may pose a physiological hazard if inhaled or ingested. Avoid inhalation of metal dusts and fumes. May cause an influenza-like illness. Avoid skin and eye contact with dusts to prevent mechanical irritation. User-generated dust is easily ignited and difficult to extinguish. The below listing is a summary of elements used in alloying stainless steels. Various grades will contain different combinations of these elements. Other trace elements may also be present in minute amounts. These small quantities (less than 0.1%), frequently referred to as "trace" or "residual" elements, generally originate in the raw material used. Values shown are applicable to component elements. *Stainless steel products as provided contain chromium metal in the zero valence state. As such, chromium metal does not present any unusual health hazard. However, welding, torch cutting, brazing, or perhaps grinding of chromium metal in stainless steel may generate airborne concentration of hexavalent chromium. The roll may have a light coating of oil to prevent corrosion.

2.4. Unknown Acute Toxicity (GHS-US/CA)

No data available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.2. Mixture

| Name | Product Identifier | % * | GHS Ingredient Classification |
|---------------|---------------------|---------|--|
| Iron | (CAS-No.) 7439-89-6 | 45 - 90 | Comb. Dust |
| Nickel | (CAS-No.) 7440-02-0 | <= 46 | Skin Sens. 1, H317 Carc. 2, H351 STOT RE 1, H372 Comb. Dust |
| Chromium | (CAS-No.) 7440-47-3 | 10 - 30 | Comb. Dust |
| Manganese | (CAS-No.) 7439-96-5 | <= 15 | Comb. Dust |
| Molybdenum | (CAS-No.) 7439-98-7 | <= 7 | Comb. Dust |
| Silicon | (CAS-No.) 7440-21-3 | <= 6.5 | Comb. Dust |
| Copper | (CAS-No.) 7440-50-8 | <= 5 | Comb. Dust |
| Cobalt | (CAS-No.) 7440-48-4 | <= 5 | Acute Tox. 4 (Oral), H302 Acute Tox. 1 (Inhalation:dust,mist), H330 Eye Irrit. 2A, H319 Resp. Sens. 1B, H334 Skin Sens. 1, H317 Carc. 1B, H350 Repr. 2, H361 Aquatic Acute 1, H400 Aquatic Chronic 1, H410 Comb. Dust |
| Tungsten | (CAS-No.) 7440-33-7 | <= 4 | Comb. Dust |
| Aluminum | (CAS-No.) 7429-90-5 | <= 4 | Comb. Dust |
| Titanium | (CAS-No.) 7440-32-6 | <= 2.4 | Comb. Dust |
| Carbon | (CAS-No.) 7440-44-0 | <= 2 | Comb. Dust |
| Vanadium | (CAS-No.) 7440-62-2 | <= 1.1 | Comb. Dust |
| Tantalum | (CAS-No.) 7440-25-7 | <= 1 | Comb. Dust |
| Niobium | (CAS-No.) 7440-03-1 | <= 1 | Not classified |
| Lead | (CAS-No.) 7439-92-1 | < 0.1 | Carc. 1B, H350 Lact, H362 Repr. 1A, H360 STOT RE 1, H372 Comb. Dust |
| Paraffin oils | (CAS-No.) 8012-95-1 | < 0.1 | Acute Tox. 4 (Inhalation:dust,mist), H332 Asp. Tox. 1, H304 Aquatic Chronic 4, H413 |
| Nitrogen | (CAS-No.) 7727-37-9 | <= 0.06 | Simple Asphy Press. Gas (Comp.), H280 |

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| | | | |
|--------|---------------------|---------|--|
| Sulfur | (CAS-No.) 7704-34-9 | <= 0.06 | Skin Irrit. 2, H315 Aquatic Acute 3, H402 Comb. Dust |
|--------|---------------------|---------|--|

Full text of H-phrases: see Section 16.

*Percentages are listed in weight by weight percentage (w/w%) for liquid and solid ingredients. Gas ingredients are listed in volume by volume percentage (v/v%).

SECTION 4: FIRST AID MEASURES

4.1. Description of First-aid Measures

General: If injury occurs or if you feel unwell seek medical advice.

Inhalation: If inhaled, remove to fresh air and keep at rest 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. Wash contaminated clothing before reuse. Obtain medical attention if irritation develops or persists.

Eye Contact: Immediately rinse with water for a prolonged period (at least 15 minutes) while holding the eyelids wide open. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if irritation develops or persists.

Ingestion: If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

4.2. Most Important Symptoms and Effects Both Acute and Delayed

General: Skin sensitization. May cause cancer. May damage fertility or the unborn child. Under normal conditions of use not expected to present a significant hazard. Under milling, or physical alteration metal dusts may be produced that cause irritation of the respiratory tract, skin, and may be harmful. Molten material may release toxic, and irritating fumes.

Inhalation: During processing, the most significant route of exposure is by the inhalation (breathing) of fumes. If fumes are inhaled, they can cause a condition commonly known as metal fume fever with symptoms which resemble influenza; Symptoms may be delayed 4-12 hours and begin with a sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms may include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Fever, chills, muscular pain, mild to severe headache, nausea, occasional vomiting, exaggerated mental activity, profuse sweating, excessive urination, diarrhea and prostration may also occur.

Skin Contact: Dust may cause irritation in skin folds or by contact in combination with tight clothing. Contact with hot, molten metal will cause thermal burns. Removal of solidified molten material from skin requires medical assistance.

Eye Contact: Dust generated from material cutting may cause a slight irritation. Slivers may be generated, which could cause mechanical irritation or injure the eye. Dusts caused from milling and physical alteration will likely cause eye irritation. Fumes from thermal decomposition or molten material will likely be irritating to the eyes.

Ingestion: If large amounts are ingested: Gastrointestinal irritation.

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Chronic Symptoms: May cause cancer. May damage fertility or the unborn child. 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. Chromium: Certain hexavalent chromium compounds have been demonstrated to be carcinogenic on the basis of epidemiological investigations on workers and experimental studies in animals. Increased incidences of respiratory cancer have been found in chromium (VI) workers. There is an increased incidence of lung cancer in industrial workers exposed to chromium (VI) compounds. Please refer to IARC volume 23 for a more detailed discussion. Manganese: Chronic exposure can cause inflammation of the lung tissue, scarring the lungs (pulmonary fibrosis). Chronic exposure to excessive manganese levels can lead to a variety of psychiatric and motor disturbances, termed manganism. Molybdenum: Chronic exposure to molybdenum compounds is suspected of causing cancer. Compounds are also known to cause irritation to the skin, eyes, and respiratory tract. Silicon: Can cause chronic bronchitis and narrowing of the airways. Copper: Overexposure to fumes may cause metal fume fever (chills, muscle aches, nausea, fever, dry throat, cough, weakness, lassitude); metallic or sweet taste; discoloration of skin and hair. Tissue damage of mucous membranes may follow chronic dust exposure. Aluminum: Inhalation of finely divided aluminum powder may cause pulmonary fibrosis. Vanadium: May cause gastrointestinal discomfort, renal damage, nervous system depression and irritation of the respiratory passages. May also cause cardiac palpitations and asthma. 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. Chronic dermal exposure to sulfur dust has been linked to headache, vertigo, irritation to the airways, breathing difficulties, coordination disturbances, accelerated pulse, hypotonia, cramps and unconsciousness. Frequent dermal contact with sulfur dusts mainly caused skin damage in the form of eczematous or ulcerous changes.

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

If medical advice is needed, have product container or label at hand.

SECTION 5: FIRE-FIGHTING MEASURES

5.1. Extinguishing Media

Suitable Extinguishing Media: Use extinguishing media appropriate for surrounding fire.

Unsuitable Extinguishing Media: Do not use halogenated extinguishing agents on small chips or fines. Do not use water when molten material is involved, contact of hot product with water will result in a violent expansion as the water turns to steam causing explosion with massive force.

5.2. Special Hazards Arising From the Substance or Mixture

Fire Hazard: Not considered flammable but will burn at high temperatures. Small chips, turnings, dust and fines from processing may be readily ignitable.

Explosion Hazard: Product is not explosive. Dust generated from processing may present a dust explosion hazard.

Reactivity: Hazardous reactions will not occur under normal conditions.

5.3. Advice for Firefighters

Precautionary Measures Fire: Exercise caution when fighting any chemical fire. Under fire conditions, hazardous fumes will be present.

Firefighting Instructions: Do not breathe fumes from fires or vapors from decomposition. Keep upwind. Use water spray or fog for cooling exposed containers.

Protection During Firefighting: Firefighters must use full bunker gear including NIOSH-approved positive-pressure self-contained breathing apparatus to protect against potential hazardous combustion and decomposition products.

Hazardous Combustion Products: Metallic oxides. Nickel oxides. Iron oxides. If heated to the point of fume generation zinc fumes may cause metal fume fever. Otherwise, zinc is non-toxic. Hydrocarbons.

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 get in eyes, on skin, or on clothing. Do not breathe dust or fumes.

6.1.1. For Non-Emergency Personnel

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

Emergency Procedures: Evacuate unnecessary personnel.

6.1.2. For Emergency Personnel

Protective Equipment: Equip cleanup crew with proper protection.

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Emergency Procedures: Upon arrival at the scene, a first responder is expected to recognize the presence of dangerous goods, protect oneself and the public, secure the area, and call for the assistance of trained personnel as soon as conditions permit.

6.2. Environmental Precautions

Do not allow to enter drains or water courses.

6.3. Methods and Materials for Containment and Cleaning Up

For Containment: Contain solid spills with appropriate barriers and prevent migration and entry into sewers or streams. Collect scrap for recycling. If molten: contain the flow using dry sand or salt flux as a dam. Do not use shovels or hand tools to halt the flow of molten material. Allow the spill to cool before re-melting as scrap.

Methods for Cleaning Up: Avoid generation of dust during clean-up of spills. Take up mechanically (sweeping, shoveling) and collect in suitable container for disposal. Vacuum must be fitted with HEPA filter to prevent release of particulates during clean-up. Use only non-sparking tools. Use explosion-proof equipment.

6.4. Reference to Other Sections

See Section 8 for exposure controls and personal protection and Section 13 for disposal considerations.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for Safe Handling

Additional Hazards When Processed: Risk of thermal burns on contact with molten product. Accumulation and dispersion of dust with an ignition source can cause a combustible dust explosion. Keep dust levels to a minimum and follow applicable regulations.

May be a potential hazard under the following conditions:

- Small chunks, dust or fines in contact with water can generate flammable or toxic gases. These gases could present an explosion hazard in confined or poorly ventilated spaces.
- Molten metal in contact with water/moisture or certain metal oxides (e.g., rust, copper oxide). Moisture entrapped by molten metal can be explosive. Contact of molten aluminum with certain metal oxides can initiate a thermite reaction. Finely divided metals (e.g., powders or wire) may have enough surface oxide to produce thermite reactions/explosions.

Precautions for Safe Handling: Do not breathe dust. Do not get in eyes, on skin, or on clothing. Avoid creating or spreading dust. Always wash hands after handling the product. Do not eat, drink or smoke when using this product. Ensure there is adequate ventilation. Wear recommended personal protective equipment.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Always wash your hands immediately after handling this product, and once again before leaving the workplace. Wash contaminated clothing before reuse. Do not eat, drink or smoke in areas where product is used.

7.2. Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Comply with applicable regulations.

Storage Conditions: Store in original container. Store in a dry, cool place. Store in a well-ventilated place. Keep container tightly closed.

Incompatible Materials: Oxidizers. Acids. Bases. Mineral acids. Corrosive substances in contact with metals may produce flammable hydrogen gas.

7.3. Specific End Use(s)

Solid Product, Various Forms and Uses.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control Parameters

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), AIHA (WEEL), NIOSH (REL), OSHA (PEL), or Canadian provincial governments.

| Nickel (7440-02-0) | | |
|--------------------|--------------------------------------|--|
| USA ACGIH | ACGIH TWA (mg/m ³) | 1.5 mg/m ³ (inhalable particulate matter) |
| USA ACGIH | ACGIH chemical category | Not Suspected as a Human Carcinogen |
| 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 particulate matter) |
| New Brunswick | OEL TWA (mg/m ³) | 1 mg/m ³ |

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| Newfoundland & Labrador | OEL TWA (mg/m ³) | 1.5 mg/m ³ (inhalable particulate matter) |
| Nova Scotia | OEL TWA (mg/m ³) | 1.5 mg/m ³ (inhalable particulate matter) |
| Nunavut | OEL STEL (mg/m ³) | 3 mg/m ³ (inhalable fraction) |
| Nunavut | OEL TWA (mg/m ³) | 1.5 mg/m ³ (inhalable fraction) |
| Northwest Territories | OEL STEL (mg/m ³) | 3 mg/m ³ (inhalable fraction) |
| Northwest Territories | OEL TWA (mg/m ³) | 1.5 mg/m ³ (inhalable fraction) |
| 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 particulate matter) |
| 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 |
| Chromium (7440-47-3) | | |
| USA ACGIH | ACGIH TWA (mg/m ³) | 0.5 mg/m ³ |
| USA ACGIH | ACGIH chemical category | Not Classifiable as a Human Carcinogen |
| USA OSHA | OSHA PEL (TWA) (mg/m ³) | 1 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 |
| Alberta | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| British Columbia | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| Manitoba | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| New Brunswick | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| Newfoundland & Labrador | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| Nova Scotia | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| Nunavut | OEL STEL (mg/m ³) | 1.5 mg/m ³ (metal) |
| Nunavut | OEL TWA (mg/m ³) | 0.5 mg/m ³ (metal) |
| Northwest Territories | OEL STEL (mg/m ³) | 1.5 mg/m ³ (metal) |
| Northwest Territories | OEL TWA (mg/m ³) | 0.5 mg/m ³ (metal) |
| Ontario | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| Prince Edward Island | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| Québec | VEMP (mg/m ³) | 0.5 mg/m ³ |
| Saskatchewan | OEL STEL (mg/m ³) | 1.5 mg/m ³ |
| Saskatchewan | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| Yukon | OEL STEL (mg/m ³) | 3 mg/m ³ |
| Yukon | OEL TWA (mg/m ³) | 0.1 mg/m ³ |
| Manganese (7439-96-5) | | |
| USA ACGIH | ACGIH TWA (mg/m ³) | 0.02 mg/m ³ (respirable particulate matter) 0.1 mg/m ³ (inhalable particulate matter) |
| USA ACGIH | ACGIH chemical category | Not Classifiable as a Human Carcinogen |
| 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 particulate matter) 0.1 mg/m ³ (inhalable particulate matter) |
| 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 particulate matter) 0.1 mg/m ³ (inhalable particulate matter) |
| Nova Scotia | OEL TWA (mg/m ³) | 0.02 mg/m ³ (respirable particulate matter) |

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| | | 0.1 mg/m ³ (inhalable particulate matter) |
| Nunavut | OEL STEL (mg/m ³) | 0.6 mg/m ³ |
| Nunavut | OEL TWA (mg/m ³) | 0.2 mg/m ³ |
| Northwest Territories | OEL STEL (mg/m ³) | 0.6 mg/m ³ |
| Northwest Territories | OEL TWA (mg/m ³) | 0.2 mg/m ³ |
| 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 particulate matter) 0.1 mg/m ³ (inhalable particulate matter) |
| 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 |
| Molybdenum (7439-98-7) | | |
| | Internal TWA (mg/m ³) | 5 mg/m ³ (Molybdenum (as Mo), Soluble Compounds) |
| USA ACGIH | ACGIH TWA (mg/m ³) | 10 mg/m ³ (inhalable particulate matter) 3 mg/m ³ (respirable particulate matter) |
| USA OSHA | OSHA PEL (TWA) (mg/m ³) | 5 mg/m ³ (Molybdenum (as Mo), Soluble Compounds) 15 mg/m ³ (Molybdenum (as Mo), Insoluble Compounds) (Total dust) |
| USA NIOSH | NIOSH REL (TWA) (mg/m ³) | 5 mg/m ³ (Molybdenum (as Mo), Soluble Compounds) |
| USA IDLH | US IDLH (mg/m ³) | 5000 mg/m ³ |
| Alberta | OEL TWA (mg/m ³) | 10 mg/m ³ (total) 3 mg/m ³ (respirable) |
| British Columbia | OEL TWA (mg/m ³) | 3 mg/m ³ (respirable) 10 mg/m ³ (inhalable) |
| Manitoba | OEL TWA (mg/m ³) | 3 mg/m ³ (respirable particulate matter) 10 mg/m ³ (inhalable particulate matter) |
| Newfoundland & Labrador | OEL TWA (mg/m ³) | 3 mg/m ³ (respirable particulate matter) 10 mg/m ³ (inhalable particulate matter) |
| Nova Scotia | OEL TWA (mg/m ³) | 3 mg/m ³ (respirable particulate matter) 10 mg/m ³ (inhalable particulate matter) |
| Nunavut | OEL STEL (mg/m ³) | 20 mg/m ³ (metal-inhalable fraction) 6 mg/m ³ (metal-respirable fraction) |
| Nunavut | OEL TWA (mg/m ³) | 10 mg/m ³ (metal-inhalable fraction) 3 mg/m ³ (metal-respirable fraction) |
| Northwest Territories | OEL STEL (mg/m ³) | 20 mg/m ³ (metal-inhalable fraction) 6 mg/m ³ (metal-respirable fraction) |
| Northwest Territories | OEL TWA (mg/m ³) | 10 mg/m ³ (metal-inhalable fraction) 3 mg/m ³ (metal-respirable fraction) |
| Ontario | OEL TWA (mg/m ³) | 10 mg/m ³ (metal-inhalable) 3 mg/m ³ (metal-respirable) |
| Prince Edward Island | OEL TWA (mg/m ³) | 3 mg/m ³ (respirable particulate matter) 10 mg/m ³ (inhalable particulate matter) |
| Saskatchewan | OEL STEL (mg/m ³) | 20 mg/m ³ (inhalable fraction) 6 mg/m ³ (respirable fraction) |
| Saskatchewan | OEL TWA (mg/m ³) | 10 mg/m ³ (inhalable fraction) 3 mg/m ³ (respirable fraction) |
| Silicon (7440-21-3) | | |
| 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) |

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| | | |
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| British Columbia | OEL TWA (mg/m ³) | 10 mg/m ³ (total dust) 3 mg/m ³ (respirable fraction) |
| New Brunswick | OEL TWA (mg/m ³) | 10 mg/m ³ |
| Nunavut | OEL STEL (mg/m ³) | 20 mg/m ³ |
| Nunavut | OEL TWA (mg/m ³) | 10 mg/m ³ |
| Northwest Territories | OEL STEL (mg/m ³) | 20 mg/m ³ |
| Northwest Territories | OEL TWA (mg/m ³) | 10 mg/m ³ |
| 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) | 30 mppcf 10 mg/m ³ |
| Copper (7440-50-8) | | |
| 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) 1 mg/m ³ (dust and mist) |
| British Columbia | OEL TWA (mg/m ³) | 1 mg/m ³ (dust and mist) 0.2 mg/m ³ (fume) |
| 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) 1 mg/m ³ (dust and mist) |
| Newfoundland & Labrador | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) |
| Nova Scotia | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) |
| Nunavut | OEL STEL (mg/m ³) | 3 mg/m ³ (dust and mist) 0.6 mg/m ³ (fume) |
| Nunavut | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist) |
| Northwest Territories | OEL STEL (mg/m ³) | 3 mg/m ³ (dust and mist) 0.6 mg/m ³ (fume) |
| Northwest Territories | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist) |
| Ontario | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist) |
| 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) 1 mg/m ³ (dust and mist) |
| Saskatchewan | OEL STEL (mg/m ³) | 0.6 mg/m ³ (fume) 3 mg/m ³ (dust and mist) |
| Saskatchewan | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist) |
| Yukon | OEL STEL (mg/m ³) | 0.2 mg/m ³ (fume) 2 mg/m ³ (dust and mist) |
| Yukon | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist) |
| Cobalt (7440-48-4) | | |

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| | | |
|------------------------------------|---------------------------------------|--|
| USA ACGIH | ACGIH TWA (mg/m ³) | 0.02 mg/m ³ |
| USA ACGIH | ACGIH chemical category | Confirmed Animal Carcinogen with Unknown Relevance to Humans |
| USA ACGIH | Biological Exposure Indices (BEI) | 15 µg/l Parameter: Cobalt - Medium: urine - Sampling time: end of shift at end of workweek (nonspecific) |
| 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) | 0.06 mg/m ³ |
| Nunavut | OEL TWA (mg/m ³) | 0.02 mg/m ³ |
| Northwest Territories | OEL STEL (mg/m ³) | 0.06 mg/m ³ |
| Northwest Territories | OEL TWA (mg/m ³) | 0.02 mg/m ³ |
| 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) |
| Tungsten (7440-33-7) | | |
| USA ACGIH | ACGIH TWA (mg/m ³) | 3 mg/m ³ (respirable particulate matter) |
| USA NIOSH | NIOSH REL (TWA) (mg/m ³) | 5 mg/m ³ |
| USA NIOSH | NIOSH REL (STEL) (mg/m ³) | 10 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 TWA (mg/m ³) | 3 mg/m ³ (respirable particulate matter) |
| Newfoundland & Labrador | OEL TWA (mg/m ³) | 3 mg/m ³ (respirable particulate matter) |
| Nova Scotia | OEL TWA (mg/m ³) | 3 mg/m ³ (respirable particulate matter) |
| Nunavut | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Nunavut | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Northwest Territories | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Northwest Territories | 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 TWA (mg/m ³) | 3 mg/m ³ (respirable particulate matter) |
| Saskatchewan | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Saskatchewan | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Yukon | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Yukon | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Aluminum (7429-90-5) | | |
| USA ACGIH | ACGIH TWA (mg/m ³) | 1 mg/m ³ (respirable particulate matter) |
| USA ACGIH | ACGIH chemical category | Not Classifiable as a Human Carcinogen |
| USA OSHA | OSHA PEL (TWA) (mg/m ³) | 15 mg/m ³ (total dust) 5 mg/m ³ (respirable fraction) |

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| | | |
|------------------------------------|---|--|
| USA NIOSH | NIOSH REL (TWA) (mg/m ³) | 10 mg/m ³ (total dust) 5 mg/m ³ (respirable dust) |
| Alberta | OEL TWA (mg/m ³) | 10 mg/m ³ (dust) |
| British Columbia | OEL TWA (mg/m ³) | 1 mg/m ³ (respirable) |
| Manitoba | OEL TWA (mg/m ³) | 1 mg/m ³ (respirable particulate matter) |
| New Brunswick | OEL TWA (mg/m ³) | 10 mg/m ³ (metal dust) |
| Newfoundland & Labrador | OEL TWA (mg/m ³) | 1 mg/m ³ (respirable particulate matter) |
| Nova Scotia | OEL TWA (mg/m ³) | 1 mg/m ³ (respirable particulate matter) |
| Nunavut | OEL STEL (mg/m ³) | 20 mg/m ³ (metal-dust) |
| Nunavut | OEL TWA (mg/m ³) | 10 mg/m ³ (metal-dust) |
| Northwest Territories | OEL STEL (mg/m ³) | 20 mg/m ³ (metal-dust) |
| Northwest Territories | OEL TWA (mg/m ³) | 10 mg/m ³ (metal-dust) |
| Ontario | OEL TWA (mg/m ³) | 1 mg/m ³ (respirable) |
| Prince Edward Island | OEL TWA (mg/m ³) | 1 mg/m ³ (respirable particulate matter) |
| Québec | VEMP (mg/m ³) | 10 mg/m ³ |
| Saskatchewan | OEL STEL (mg/m ³) | 20 mg/m ³ (dust) |
| Saskatchewan | OEL TWA (mg/m ³) | 10 mg/m ³ (dust) |
| Vanadium (7440-62-2) | | |
| USA OSHA | OSHA PEL (Ceiling) (mg/m ³) | 0.5 mg/m ³ (respirable dust) 0.1 mg/m ³ (fume) |
| USA NIOSH | NIOSH REL (TWA) (mg/m ³) | 1 mg/m ³ |
| USA NIOSH | NIOSH REL (STEL) (mg/m ³) | 3 mg/m ³ |
| Tantalum (7440-25-7) | | |
| USA OSHA | OSHA PEL (TWA) (mg/m ³) | 5 mg/m ³ |
| USA NIOSH | NIOSH REL (TWA) (mg/m ³) | 5 mg/m ³ (dust) |
| USA NIOSH | NIOSH REL (STEL) (mg/m ³) | 10 mg/m ³ (dust) |
| USA IDLH | US IDLH (mg/m ³) | 2500 mg/m ³ (dust) |
| Alberta | OEL TWA (mg/m ³) | 5 mg/m ³ (dust) |
| British Columbia | OEL TWA (mg/m ³) | 5 mg/m ³ |
| New Brunswick | OEL TWA (mg/m ³) | 5 mg/m ³ (dust) |
| Nunavut | OEL STEL (mg/m ³) | 10 mg/m ³ (metal) |
| Nunavut | OEL TWA (mg/m ³) | 5 mg/m ³ (metal) |
| Northwest Territories | OEL STEL (mg/m ³) | 10 mg/m ³ (metal) |
| Northwest Territories | OEL TWA (mg/m ³) | 5 mg/m ³ (metal) |
| Québec | VEMP (mg/m ³) | 5 mg/m ³ (dust) |
| Saskatchewan | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Saskatchewan | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Yukon | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Yukon | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Lead (7439-92-1) | | |
| USA ACGIH | ACGIH TWA (mg/m ³) | 0.05 mg/m ³ |
| USA ACGIH | ACGIH chemical category | Confirmed Animal Carcinogen with Unknown Relevance to Humans |
| USA ACGIH | Biological Exposure Indices (BEI) | 200 µg/l Parameter: Lead - Medium: blood - Sampling time: not critical (Note: Persons applying this BEI are encouraged to counsel female workers of child-bearing age about the risk of delivering a child with a PbB (lead in blood level) over the current CDC reference value.) |
| USA OSHA | OSHA PEL (TWA) (mg/m ³) | 50 µg/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 |

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| | | |
|------------------------------------|---------------------------------------|--|
| 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) | 0.15 mg/m ³ |
| Nunavut | OEL TWA (mg/m ³) | 0.05 mg/m ³ |
| Northwest Territories | OEL STEL (mg/m ³) | 0.15 mg/m ³ |
| Northwest Territories | OEL TWA (mg/m ³) | 0.05 mg/m ³ |
| Ontario | OEL TWA (mg/m ³) | 0.05 mg/m ³ (designated substances regulation) 0.05 mg/m ³ (applies to workplaces to which the designated substances regulation does not apply) |
| 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) |
| Paraffin oils (8012-95-1) | | |
| USA ACGIH | ACGIH TWA (mg/m ³) | 5 mg/m ³ (excluding metal working fluids, highly & severely refined-inhalable particulate matter) |
| USA ACGIH | ACGIH chemical category | Not Classifiable as a Human Carcinogen highly and severely refined, Suspected Human Carcinogen highly and severely refined |
| USA OSHA | OSHA PEL (TWA) (mg/m ³) | 5 mg/m ³ |
| 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) | 2500 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 TWA (mg/m ³) | 0.2 mg/m ³ (mildly refined) 1 mg/m ³ (severely refined) |
| Manitoba | OEL TWA (mg/m ³) | 5 mg/m ³ (excluding metal working fluids, highly & severely refined-inhalable particulate matter) |
| New Brunswick | OEL STEL (mg/m ³) | 10 mg/m ³ |
| New Brunswick | OEL TWA (mg/m ³) | 5 mg/m ³ (as sampled by a method that does not collect vapor) |
| Newfoundland & Labrador | OEL TWA (mg/m ³) | 5 mg/m ³ (excluding metal working fluids, highly & severely refined-inhalable particulate matter) |
| Nova Scotia | OEL TWA (mg/m ³) | 5 mg/m ³ (excluding metal working fluids, highly & severely refined-inhalable particulate matter) |
| Nunavut | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Nunavut | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Northwest Territories | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Northwest Territories | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Ontario | OEL TWA (mg/m ³) | 5 mg/m ³ (pure, highly and severely refined, excluding metal working fluids-inhalable) |
| Prince Edward Island | OEL TWA (mg/m ³) | 5 mg/m ³ (excluding metal working fluids, highly & severely refined-inhalable particulate matter) |
| Québec | VECD (mg/m ³) | 10 mg/m ³ (mist) |
| Québec | VEMP (mg/m ³) | 5 mg/m ³ (mist) |
| Saskatchewan | OEL STEL (mg/m ³) | 10 mg/m ³ |

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| | | |
|-----------------------------|-------------------------------|--|
| Saskatchewan | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Yukon | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Yukon | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Nitrogen (7727-37-9) | | |
| USA ACGIH | ACGIH chemical category | Simple asphyxiant See Appendix F: Minimal Oxygen Content |
| Sulfur (7704-34-9) | | |
| Alberta | OEL TWA (mg/m ³) | 10 mg/m ³ |

8.2. Exposure Controls

Appropriate Engineering Controls: Emergency eye wash fountain capability should be available in the immediate vicinity of any potential exposure. Ensure adequate ventilation, especially in confined areas. In powdered form: Avoid dust production. Take precautionary measures against static discharges. Use explosion-proof equipment.

Personal Protective Equipment: Gloves. Protective clothing. Protective goggles. Insufficient ventilation: wear respiratory protection.



Materials for Protective Clothing: Chemically resistant materials and fabrics.

Hand Protection: Impermeable protective gloves.

Eye and Face Protection: Chemical safety goggles. Welders should wear goggles or safety glasses with side shields that comply with ANSI Z87.1 under welding helmets and always wear goggles or other suitable eye protection when gas welding or oxygen cutting.

Skin and Body Protection: Wear suitable protective clothing.

Respiratory Protection: Fumes and dust : If exposure limits are exceeded or irritation is experienced, approved respiratory protection should be worn.

Thermal Hazard Protection: When working with hot material, use suitable thermally protective clothing.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on Basic Physical and Chemical Properties

| | |
|--|--------------------|
| Physical State | : Solid |
| Appearance | : Gray; Metallic |
| Odor | : Odorless |
| Odor Threshold | : Not available |
| pH | : Not available |
| Evaporation Rate | : Not available |
| Melting Point | : Not available |
| 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 |
| Relative Density | : Not available |
| Specific Gravity | : Not available |
| Solubility | : Water: Insoluble |
| Partition Coefficient: N-Octanol/Water | : Not available |
| Viscosity | : Not available |

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SECTION 10: STABILITY AND REACTIVITY

- 10.1. Reactivity:** Hazardous reactions will not occur under normal conditions.
- 10.2. Chemical Stability:** 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:** Dust, chips, or ribbons can be ignited more easily, by an ignition source, by improper machining, or by spontaneous combustion if finely divided and damp.
- 10.5. Incompatible Materials:** Oxidizers. Acids. Bases. Mineral acids. Corrosive substances in contact with metals may produce flammable hydrogen gas.
- 10.6. Hazardous Decomposition Products:** None expected under normal conditions of use.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on Toxicological Effects - Product

Acute Toxicity (Oral): Oral: Not classified

Acute Toxicity (Dermal): Not classified

Acute Toxicity (Inhalation): Not classified

LD50 and LC50 Data: Not available

Skin Corrosion/Irritation: Not classified

Eye Damage/Irritation: Not classified

Respiratory or Skin Sensitization: Not classified. May cause an allergic skin reaction.

Germ Cell Mutagenicity: Not classified

Carcinogenicity: May cause cancer.

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

Reproductive Toxicity: May damage fertility or the unborn child.

Specific Target Organ Toxicity (Single Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries After Inhalation: During processing, the most significant route of exposure is by the inhalation (breathing) of fumes. If fumes are inhaled, they can cause a condition commonly known as metal fume fever with symptoms which resemble influenza; Symptoms may be delayed 4-12 hours and begin with a sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms may include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Fever, chills, muscular pain, mild to severe headache, nausea, occasional vomiting, exaggerated mental activity, profuse sweating, excessive urination, diarrhea and prostration may also occur.

Symptoms/Injuries After Skin Contact: Dust may cause irritation in skin folds or by contact in combination with tight clothing. Contact with hot, molten metal will cause thermal burns. Removal of solidified molten material from skin requires medical assistance.

Symptoms/Injuries After Eye Contact: Dust generated from material cutting may cause a slight irritation. Slivers may be generated, which could cause mechanical irritation or injure the eye. Dusts caused from milling and physical alteration will likely cause eye irritation. Fumes from thermal decomposition or molten material will likely be irritating to the eyes.

Symptoms/Injuries After Ingestion: If large amounts are ingested: Gastrointestinal irritation.

Chronic Symptoms: May cause cancer. May damage fertility or the unborn child. 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. Chromium: Certain hexavalent chromium compounds have been demonstrated to be carcinogenic on the basis of epidemiological investigations on workers and experimental studies in animals. Increased incidences of respiratory cancer have been found in chromium (VI) workers. There is an increased incidence of lung cancer in industrial workers exposed to chromium (VI) compounds. Please refer to IARC volume 23 for a more detailed discussion. Manganese: Chronic exposure can cause inflammation of the lung tissue, scarring the lungs (pulmonary fibrosis). Chronic exposure to excessive manganese levels can lead to a variety of psychiatric and motor disturbances, termed manganism. Molybdenum: Chronic exposure to molybdenum compounds is suspected of causing cancer. Compounds are also known to cause irritation to the skin, eyes, and respiratory tract. Silicon: Can cause chronic bronchitis and narrowing of the airways. Copper: Overexposure to fumes may cause metal fume fever (chills, muscle aches, nausea, fever, dry throat, cough, weakness, lassitude); metallic or sweet taste; discoloration of skin and hair. Tissue damage of mucous membranes may follow chronic dust exposure. Aluminum: Inhalation of finely divided aluminum powder may cause pulmonary fibrosis. Vanadium: May cause gastrointestinal discomfort, renal damage, nervous system depression and irritation of the respiratory passages. May also cause cardiac palpitations and asthma. Lead: Exposure can result in lassitude (weakness, exhaustion),

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insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; encephalopathy; kidney disease; hypertension. Chronic dermal exposure to sulfur dust has been linked to headache, vertigo, irritation to the airways, breathing difficulties, coordination disturbances, accelerated pulse, hypotonia, cramps and unconsciousness. Frequent dermal contact with sulfur dusts mainly caused skin damage in the form of eczematous or ulcerous changes.

11.2. Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data:

| | |
|---|--|
| Iron (7439-89-6) | |
| LD50 Oral Rat | 98.6 g/kg |
| Nickel (7440-02-0) | |
| LD50 Oral Rat | > 9000 mg/kg |
| Chromium (7440-47-3) | |
| LD50 Oral Rat | > 5000 mg/kg |
| LC50 Inhalation Rat | > 5.41 mg/l/4h |
| Manganese (7439-96-5) | |
| LD50 Oral Rat | > 2000 mg/kg |
| LC50 Inhalation Rat | > 5.14 mg/l/4h |
| Molybdenum (7439-98-7) | |
| LD50 Oral Rat | > 2000 mg/kg |
| LD50 Dermal Rat | > 2000 mg/kg |
| LC50 Inhalation Rat | > 3.92 mg/l/4h |
| Silicon (7440-21-3) | |
| LD50 Oral Rat | 3160 mg/kg |
| Cobalt (7440-48-4) | |
| LD50 Oral Rat | 215.9 - 1140 mg/kg |
| LC50 Inhalation Rat | > 10 mg/l (Exposure time: 1 h) |
| LC50 Inhalation Rat | < 0.05 mg/l/4h |
| ATE US/CA (dust, mist) | 0.01 mg/l/4h |
| Carbon (7440-44-0) | |
| LD50 Oral Rat | > 10000 mg/kg |
| Tantalum (7440-25-7) | |
| LD50 Oral Rat | > 2000 mg/kg |
| LD50 Dermal Rat | > 2000 mg/kg |
| Niobium (7440-03-1) | |
| LD50 Oral Rat | > 10 g/kg |
| Paraffin oils (8012-95-1) | |
| LD50 Oral Rat | > 24 g/kg |
| LC50 Inhalation Rat | 2062 ppm/4h |
| ATE US/CA (dust, mist) | 1.50 mg/l/4h |
| Sulfur (7704-34-9) | |
| LD50 Oral Rat | > 3000 mg/kg |
| LD50 Dermal Rabbit | > 2000 mg/kg |
| LC50 Inhalation Rat | > 9.23 mg/l/4h |
| Nickel (7440-02-0) | |
| IARC Group | 2B |
| National Toxicology Program (NTP) Status | Reasonably anticipated to be Human Carcinogen. |
| OSHA Hazard Communication Carcinogen List | In OSHA Hazard Communication Carcinogen list. |
| Chromium (7440-47-3) | |
| IARC Group | 3 |
| Cobalt (7440-48-4) | |
| IARC Group | 2B |

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| | |
|--|---|
| National Toxicology Program (NTP) Status | Evidence of Carcinogenicity, Reasonably anticipated to be Human Carcinogen. |
| OSHA Hazard Communication Carcinogen List | In OSHA Hazard Communication Carcinogen list. |
| Lead (7439-92-1) | |
| IARC Group | 2A |
| National Toxicology Program (NTP) Status | Reasonably anticipated to be Human Carcinogen. |
| OSHA Hazard Communication Carcinogen List | In OSHA Hazard Communication Carcinogen list. |
| Paraffin oils (8012-95-1) | |
| IARC Group | 1 |

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

Ecology - General: This product contains components that are environmentally hazardous and small chips and dust from processing may be toxic to aquatic life.

| | |
|------------------------------|--|
| Nickel (7440-02-0) | |
| LC50 Fish 1 | 100 mg/l (Exposure time: 96 h - Species: Brachydanio rerio) |
| EC50 Daphnia 1 | > 100 mg/l (Exposure time: 48 h - Species: Daphnia magna) |
| LC50 Fish 2 | 15.3 mg/l |
| EC50 Daphnia 2 | 1 mg/l (Exposure time: 48 h - Species: Daphnia magna [Static]) |
| Manganese (7439-96-5) | |
| NOEC Chronic Fish | 3.6 mg/l (Exposure time: 96h; Species: Oncorhynchus mykiss) |
| Cobalt (7440-48-4) | |
| LC50 Fish 1 | > 100 mg/l (Exposure time: 96 h - Species: Brachydanio rerio [static]) |
| Sulfur (7704-34-9) | |
| LC50 Fish 1 | 866 mg/l (Exposure time: 96 h - Species: Brachydanio rerio [static]) |
| EC50 Daphnia 1 | 736 mg/l (Exposure time: 48 h - Species: Daphnia magna) |
| LC50 Fish 2 | 14 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static]) |

12.2. Persistence and Degradability

| | |
|--------------------------------------|----------------------------|
| Stainless Steels | |
| Persistence and Degradability | Not readily biodegradable. |
| Copper (7440-50-8) | |
| Persistence and Degradability | Not readily biodegradable. |

12.3. Bioaccumulative Potential

| | |
|---------------------------|----------------------|
| Cobalt (7440-48-4) | |
| BCF Fish 1 | (no bioaccumulation) |

12.4. Mobility in Soil

Not available

12.5. Other Adverse Effects

Other Information: Avoid unnecessary release into the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste Disposal Recommendations: Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.

Additional Information: Recycle where possible and/or dispose of spent material such as metals and metal-bearing waste and submerged arc welding (SAW) flux/slag appropriately.

SECTION 14: TRANSPORT INFORMATION

The shipping description(s) stated herein were prepared in accordance with certain assumptions at the time the SDS was authored, and can vary based on a number of variables that may or may not have been known at the time the SDS was issued.

14.1. In Accordance with DOT Not regulated for transport

14.2. In Accordance with IMDG Not regulated for transport

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14.3. In Accordance with IATA Not regulated for transport

14.4. In Accordance with TDG Not regulated for transport

SECTION 15: REGULATORY INFORMATION

15.1. US Federal Regulations

| | |
|--|---|
| Stainless Steels | |
| SARA Section 311/312 Hazard Classes | Delayed (chronic) health hazard Immediate (acute) health hazard |
| Iron (7439-89-6) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |
| Nickel (7440-02-0) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory Subject to reporting requirements of United States SARA Section 313 | |
| CERCLA RQ | 100 lb (only applicable if particles are < 100 µm) |
| SARA Section 313 - Emission Reporting | 0.1 % |
| Chromium (7440-47-3) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory Subject to reporting requirements of United States SARA Section 313 | |
| CERCLA RQ | 5000 lb no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm |
| SARA Section 313 - Emission Reporting | 1 % |
| Manganese (7439-96-5) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory Subject to reporting requirements of United States SARA Section 313 | |
| SARA Section 313 - Emission Reporting | 1 % |
| Molybdenum (7439-98-7) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |
| Silicon (7440-21-3) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |
| Copper (7440-50-8) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory Subject to reporting requirements of United States SARA Section 313 | |
| CERCLA RQ | 5000 lb no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm |
| SARA Section 313 - Emission Reporting | 1 % |
| Cobalt (7440-48-4) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory Subject to reporting requirements of United States SARA Section 313 | |
| SARA Section 313 - Emission Reporting | 0.1 % |
| Tungsten (7440-33-7) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |
| Aluminum (7429-90-5) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory Subject to reporting requirements of United States SARA Section 313 | |
| SARA Section 313 - Emission Reporting | 1 % (dust or fume only) |
| Titanium (7440-32-6) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |
| Carbon (7440-44-0) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |

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| | |
|--|---|
| Vanadium (7440-62-2) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory Subject to reporting requirements of United States SARA Section 313 | |
| SARA Section 313 - Emission Reporting | 1 % (except when contained in an alloy) |
| Tantalum (7440-25-7) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |
| Niobium (7440-03-1) | |
| 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 Subject to reporting requirements of United States SARA Section 313 | |
| CERCLA RQ | 10 lb no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm |
| SARA Section 313 - Emission Reporting | 0.1 % |
| Paraffin oils (8012-95-1) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |
| Nitrogen (7727-37-9) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |
| Sulfur (7704-34-9) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |

15.2. US State Regulations

| | |
|--|--|
| Stainless Steels | |
| U.S. - California - Proposition 65 - Carcinogens List | WARNING: This product contains chemicals known to the State of California to cause cancer. |

California Proposition 65

 This product can expose you to Lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

| Chemical Name (CAS No.) | Carcinogenicity | Developmental Toxicity | Female Reproductive Toxicity | Male Reproductive Toxicity |
|-------------------------|-----------------|------------------------|------------------------------|----------------------------|
| Nickel (7440-02-0) | X | | | |
| Cobalt (7440-48-4) | X | | | |
| Lead (7439-92-1) | X | X | X | X |

| |
|--|
| 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 |

| |
|--|
| Chromium (7440-47-3) |
| U.S. - Massachusetts - Right To Know List |
| U.S. - New Jersey - Right to Know Hazardous Substance List |
| U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List |
| U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances |
| 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 |

| |
|-------------------------------|
| Molybdenum (7439-98-7) |
|-------------------------------|

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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) 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

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

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

Tungsten (7440-33-7)

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

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

Titanium (7440-32-6)

U.S. - New Jersey - Right to Know Hazardous Substance List

Vanadium (7440-62-2)

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

Tantalum (7440-25-7)

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

Lead (7439-92-1)

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
U.S. - Pennsylvania - RTK (Right to Know) List

Paraffin oils (8012-95-1)

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

Nitrogen (7727-37-9)

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

Sulfur (7704-34-9)

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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) List

15.3. Canadian Regulations

Iron (7439-89-6)

Listed on the Canadian DSL (Domestic Substances List)

Nickel (7440-02-0)

Listed on the Canadian DSL (Domestic Substances List)

Chromium (7440-47-3)

Listed on the Canadian DSL (Domestic Substances List)

Manganese (7439-96-5)

Listed on the Canadian DSL (Domestic Substances List)

Molybdenum (7439-98-7)

Listed on the Canadian DSL (Domestic Substances List)

Silicon (7440-21-3)

Listed on the Canadian DSL (Domestic Substances List)

Copper (7440-50-8)

Listed on the Canadian DSL (Domestic Substances List)

Cobalt (7440-48-4)

Listed on the Canadian DSL (Domestic Substances List)

Tungsten (7440-33-7)

Listed on the Canadian DSL (Domestic Substances List)

Aluminum (7429-90-5)

Listed on the Canadian DSL (Domestic Substances List)

Titanium (7440-32-6)

Listed on the Canadian DSL (Domestic Substances List)

Carbon (7440-44-0)

Listed on the Canadian DSL (Domestic Substances List)

Vanadium (7440-62-2)

Listed on the Canadian DSL (Domestic Substances List)

Tantalum (7440-25-7)

Listed on the Canadian DSL (Domestic Substances List)

Niobium (7440-03-1)

Listed on the Canadian DSL (Domestic Substances List)

Lead (7439-92-1)

Listed on the Canadian DSL (Domestic Substances List)

Paraffin oils (8012-95-1)

Listed on the Canadian DSL (Domestic Substances List)

Nitrogen (7727-37-9)

Listed on the Canadian DSL (Domestic Substances List)

Sulfur (7704-34-9)

Listed on the Canadian DSL (Domestic Substances List)

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Date of Preparation or Latest : 08/28/2018

Revision

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200 and Canada's Hazardous Products Regulations (HPR) SOR/2015-17.

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GHS Full Text Phrases:

| | |
|--|--|
| Acute Tox. 1 (Inhalation:dust,mist) | Acute toxicity (inhalation:dust,mist) Category 1 |
| 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 4 | Hazardous to the aquatic environment - Chronic Hazard Category 4 |
| Asp. Tox. 1 | Aspiration hazard Category 1 |
| Carc. 1B | Carcinogenicity Category 1B |
| Carc. 2 | Carcinogenicity Category 2 |
| Comb. Dust | Combustible Dust |
| Eye Irrit. 2A | Serious eye damage/eye irritation Category 2A |
| Lact | Reproductive toxicity (Lact.) |
| Press. Gas (Comp.) | Gases under pressure Compressed gas |
| Repr. 1A | Reproductive toxicity Category 1A |
| Repr. 1B | Reproductive toxicity Category 1B |
| Repr. 2 | Reproductive toxicity Category 2 |
| Resp. Sens. 1B | Respiratory sensitization, Category 1B |
| Simple Asphy | Simple Asphyxiant |
| Skin Irrit. 2 | Skin corrosion/irritation Category 2 |
| Skin Sens. 1 | Skin sensitization, Category 1 |
| STOT RE 1 | Specific target organ toxicity (repeated exposure) Category 1 |
| H280 | Contains gas under pressure; may explode if heated |
| H302 | Harmful if swallowed |
| H304 | May be fatal if swallowed and enters airways |
| H315 | Causes skin irritation |
| H317 | May cause an allergic skin reaction |
| H319 | Causes serious eye irritation |
| H330 | Fatal if inhaled |
| H332 | Harmful if inhaled |
| H334 | May cause an allergy or asthma symptoms or breathing difficulties if inhaled |
| 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 |
| H362 | May cause harm to breast-fed children |
| H372 | Causes 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 |
| H413 | May cause long lasting harmful effects to aquatic life |
| | May displace oxygen and cause rapid suffocation |

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.

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NA GHS SDS 2015 (Can, US)