INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We Protect Hoosiers and Our Environment.
100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • www.idem.IN.gov

Eric J. Holcomb
Governor

Brian C. Rockensuess
Commissioner

June 28, 2024

Mr. Matt Careins
Micropulse Incorporated
5865 East State Road 14
Columbia City, IN 46725

Dear Mr. Careins:

Re: Return to Compliance Letter
Micropulse Incorporated
INR000152827
Columbia City, Whitley County

On June 5, 2024, a representative of the Indiana Department of Environmental Management, Office of Land Quality, conducted an inspection of Micropulse Incorporated, located at 5865 East State Road 14, Columbia City, IN.

A Violation Letter was issued to your facility on June 11, 2024, as a result of the inspection. Based on information received on June 20, 2024, it has been determined that you have achieved compliance with the citations noted during the inspection.

Please direct any response to this letter and any questions to Katharine Frisbie at (317) 503-1213 or kfrisbie@idem.in.gov. Thank you for your attention to this matter.

Sincerely,

Kari A. Clevenger for

Susan Lowry
Section Chief
Hazardous Waste Compliance Section
Compliance Branch

cc: Whitley County Health Department

Frisbie, Katharine

From: Matt Careins <mcareins@micropulseinc.com>
Sent: Thursday, June 20, 2024 12:34 PM
To: Frisbie, Katharine
Subject: Micropulse, Inc IDEM Violation Letter Response
Attachments: thumbnail_IMG_2019.jpg; thumbnail_IMG_2018.jpg; thumbnail_IMG_2017.jpg; thumbnail_IMG_2020.jpg; thumbnail_IMG_2021.jpg; thumbnail_IMG_2141.jpg; thumbnail_IMG_2142.jpg; 51ZR56_AL01.jpg; thumbnail_IMG_2535.jpg; thumbnail_IMG_2573.jpg; thumbnail_IMG_2575.jpg; thumbnail_IMG_2576.jpg; thumbnail_IMG_2574.jpg; thumbnail_IMG_2583.jpg; SDS Ryerson Stainless Steel Sheet Material.pdf; Radel R-5500 NT 15.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Below are corrections and response to the Violation Letter sent to Micropulse, Inc on June 11, 2024.

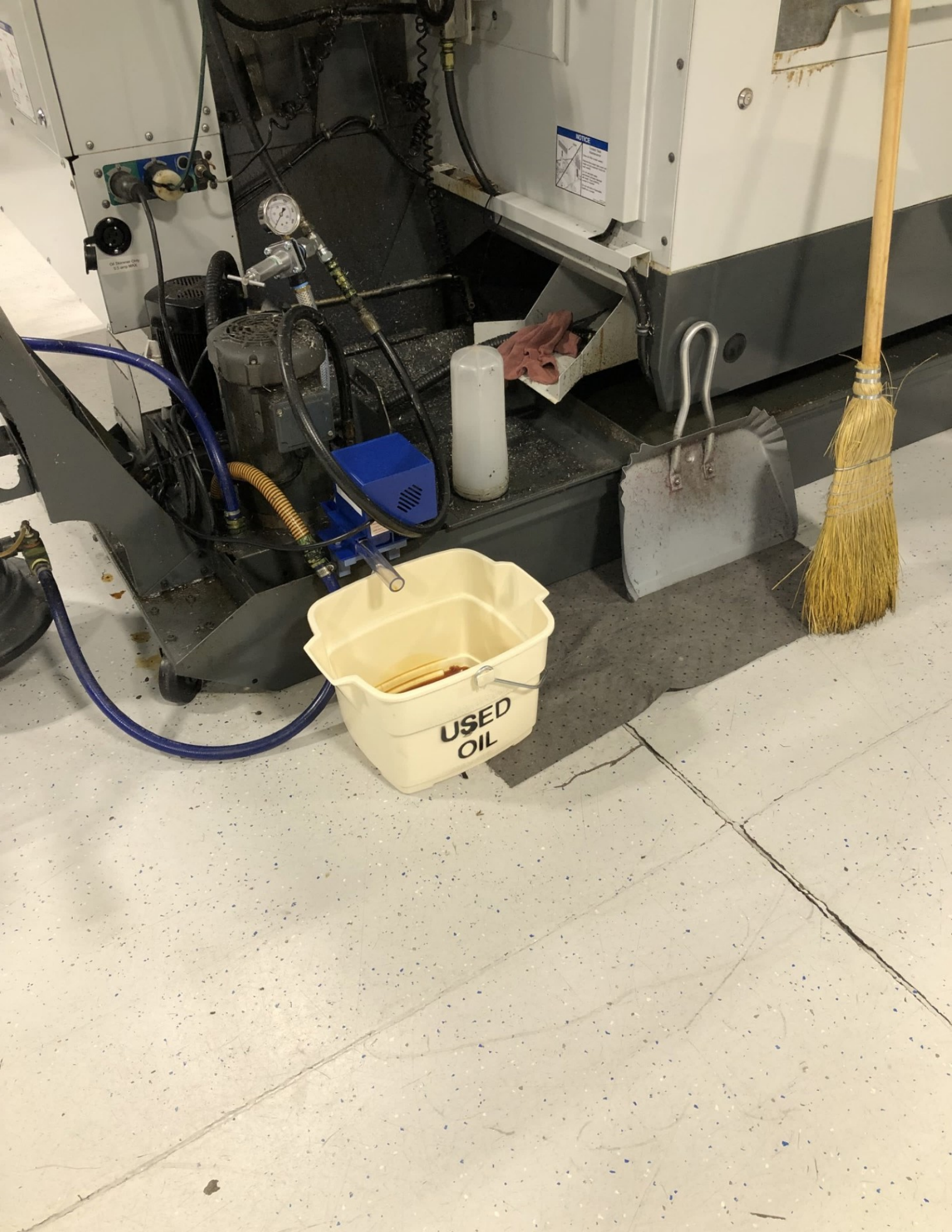
On page 2 under Inspection Narrative, 3rd paragraph, it mentions 27 "gray mills" parts washers that use non-hazardous solution of warm water and dawn dish soap. Those have been labeled and a sample of three (3) pictures have been attached.
On page 2 under Inspection Narrative, 3rd paragraph, 2nd to last sentence, the buckets are 2-gallon buckets.
On page 2 under Inspection Narrative, 4th paragraph, it mentions 3D additive printing. Satellite Accumulation Area signs and Hazardous Waste Labels were added to both units, and emergency response information was posted. Pictures are attached.
On page 3 under Waste Management, Waste Stream(s) Information, Used Oil, the generation rate is approximately five thousand (5,000) gallons per month.
On page 3 under Waste Management Areas, the Nitric and Citric Acid Contaminated material and Isopropyl Alcohol the size is 30-gallon drums.
On page 4 under Satellite Area(s), Isopropyl Alcohol is in a 30-gallon drum, and the Nitric and Citric Acid Contaminated Material in Passivation is in a plastic drum.
On page 7 under Description of Violation(s), Standards, Hazardous Waste Determination; attached are the SDS's for each of those materials. Using Generator Knowledge, the SDS's state that the materials are not DOT regulated for transportation and we've determined the materials are non-regulated waste(s) separate or mixed together.
On page 7 under Description of Violation(s), Satellite Accumulation - SQG and LQG, Container Marked with Indication of Hazards, the one (1) 30-gallon steel drum had a Hazardous Waste label on it like the one attached. On the bottom of the label, it is printed "Contains Hazardous or Toxic Wastes" meeting 40 CFR262.15(a)(5)(ii). Zooming in on photos 4 & 5, that wording can be seen.
On page 8 under Description of Violation(s), SQG Hazardous Waste Standards, Container Marked with Accumulation Start Date, the drum is a 30-gallon.

On page 8 under Description of Violation(s), Used Oil, All Facilities, Containers/Tank Labeling, the buckets are 2-gallon buckets. A stencil was created in-house with our laser cutter, and all the buckets are spray painted with "Used Oil". Pictures of five (5) samples are attached.
On Photo Table, page 4, photo number 8 was updated with check "Battery(ies) box and filled in Accumulation Start Date on the label and on the box. Photo is attached.
On Photo Table, page 6, photo number 11 was updated with "Exempt Lead Acid Batteries" label, and Accumulation Start Date. Photo is attached.
On Photo Table, page 6 and 7, photo numbers 12 and 13, under description, the drums are 30-gallon drums.

Matt Careins, EHS Coordinator

Micropulse, Inc.
5865 East State Road 14
Columbia City, Indiana 46725
(W) 260-553-8118
ISO 13485 Certified

USED
OIL


USED
OIL

MIXED

USED OIL


Cimstar 60C-HFP
NOTICE
HAAS
USED
OIL


NOTICE
USED
OIL
Lubricant


e-Manufacturing Solutions
TECHNICAL SERVICE CENTER
TSC HOT LINE: 877.337.8257
US MATERIAL ORDERS: 877.388.7916
SATELLITE ACCUMULATION AREA
EOS M 290

Micropulse
Incorporated

TELEPHONE POSTING FOR HAZARDOUS MATERIALS EMERGENCY RESPONSE

Emergency Coordinator:..Matt Careins Phone Number: 404-769-0716

First Alternate:.....Brian Tucker Phone Number: 260-229-9017

Second Alternate:.....Zach Beard Phone Number: 260-609-2385

EMERGENCY RESPONSE EQUIPMENT LOCATIONS:

Fire Extinguishers: Class D Fire Extinguishers by each door.

Fire Alarms: In Maintenace hallway at Door 35

Spill Containment & Cleanup Equipment: Wet Vac for powder

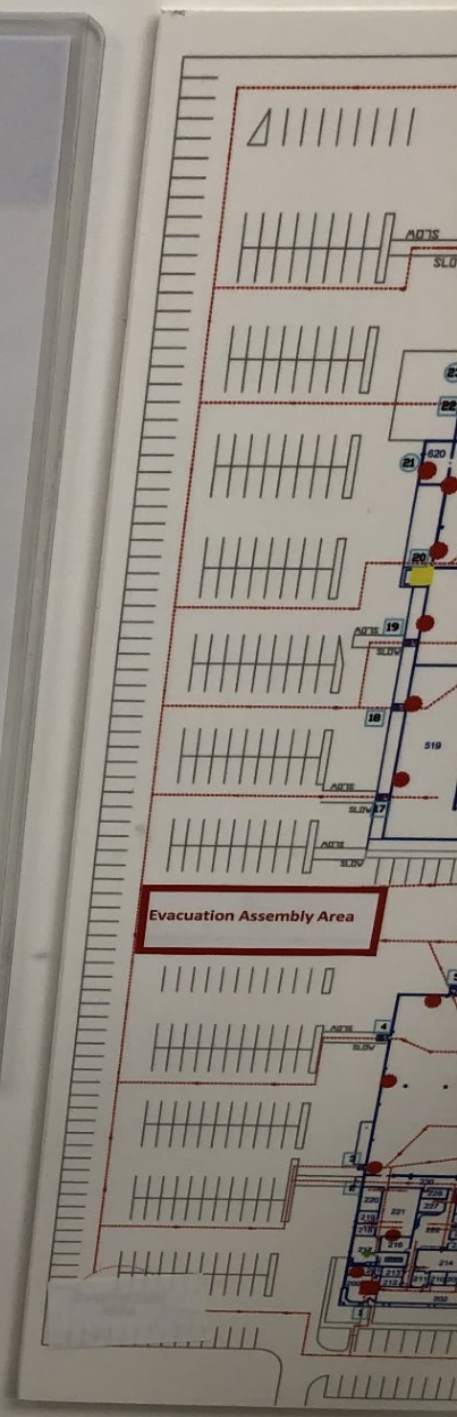
EMERGENCY TELEPHONE NUMBERS:

Fire or Explosion - Fire Department
911
Spill – Whitley County Emergency Management
260-248-3167
Spill Clean Up – Environmental Remediation Services
260-489-7062

Provide the following information.

Company Name: Micropulse Incorporated
Address: 5865 E State Road 14, Columbia City, IN 46725

Date and Time of Incident
Type of Incident (spill, fire, etc)
Type of Hazardous Materials Involved
Quantity of Hazardous Material Involved
Which Door Number Should They Enter



HAZARDOUS WASTE

ACCUMULATION
START DATE _____
CONTENTS _____

HANDLE WITH CARE!

CONTAINS HAZARDOUS OR TOXIC WASTES

Shipper Receipt	Receipt	Shipper Number
4066279 01965872	4066279 01965872	4066279

FedEx Ground® Package Returns Program

From:
From Micropulse, Inc
Address 5865 East State Road 14
City Columbia City State/Prov. IN
ZIP/Postal 46725 RMA#

Turn Over for Instructions

UNIVERSAL WASTE APPROVED

Ship To:
Cirba Solutions/Call2Recycle
4930 Holtz Drive
Wixom MI 48393

FedEx Ground
PRP

(420)48612018) 4066279 01965872

UNIVERSAL WASTE

Accumulation Start Date: 6/5/24

Check the following box and fill in the Accumulation Start Date using a ballpoint pen.

☑ Battery(ies)

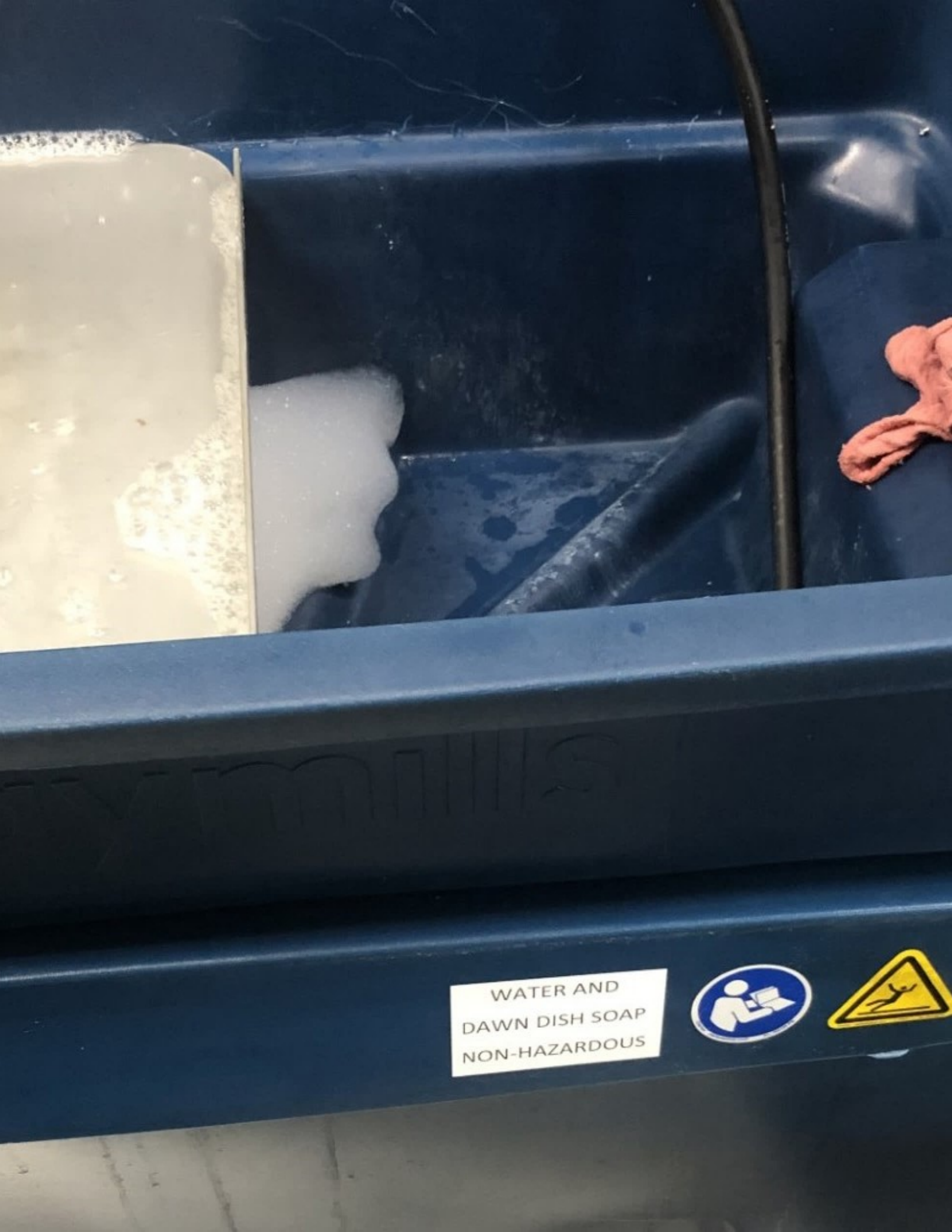
UNIVERSAL WASTE-BATTERY(IES)
FEDERAL LAW PROHIBITS IMPROPER DISPOSAL
THE FOLLOWING MATERIALS ARE REGULATED AS A UNIVERSAL WASTE IN ACCORDANCE WITH 40 CFR PART 273.

ACCUMULATION START DATE: 6-5-24

...eading the charge for recycling.™


Everyone plays a role in safety!
This box ships under USDOT-issued special permit (SP-14849)
NO DAMAGED/DEFECTIVE/RECALLED batteries
NO SWOLLEN/BLOATED BATTERIES
EXEMPT
LEAD ACID
BATTERIES
ACCUMULATION DATE 6-5-2024
Talla: Grande
10856187001692
705PF
Size: L
Talla: G
2309
5 CLASS D
20 CLASS D
3 CO2
85 ABC
86 ABC
87 ABC
88 ABC
89 ABC


WATER AND
DAWN DISH SOAP
NON-HAZARDOUS


WATER AND
DAWN DISH SOAP
NON-HAZARDOUS


WATER AND
DAWN DISH SOAP
NON-HAZARDOUS
DH436 & DH536
OPERATING INSTRUCTIONS
WARNINGS/CAUTIONS
Graymills


of particle collecting
bin before removal!
HAZARDOUS
WASTE
ACCUMULATION
START DATE
CONTENTS Titanium 3D Print Powder Waste
HANDLE WITH CARE!
CONTAINS HAZARDOUS OR TOXIC WASTE

Stainless Steels

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations And According To The Hazardous Products Regulation (February 11, 2015).

Revision Date: 10/25/2017 Date of Issue: 10/23/2015 Version: 1.0

SECTION 1: IDENTIFICATION

1.1. Product Identifier

Product Form: Mixture

Product Name: Stainless Steels

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

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) :

GHS07 GHS08

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.

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

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.

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.

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/m³)	1.5 mg/m³ (inhalable particulate matter)
USA ACGIH	ACGIH chemical category	Not Suspected as a Human Carcinogen
USA OSHA	OSHA PEL (TWA) (mg/m³)	1 mg/m³
USA NIOSH	NIOSH REL (TWA) (mg/m³)	0.015 mg/m³
USA IDLH	US IDLH (mg/m³)	10 mg/m³
Alberta	OEL TWA (mg/m³)	1.5 mg/m³
British Columbia	OEL TWA (mg/m³)	0.05 mg/m³
Manitoba	OEL TWA (mg/m³)	1.5 mg/m³ (inhalable particulate matter)
New Brunswick	OEL TWA (mg/m³)	1 mg/m³

Newfoundland & Labrador	OEL TWA (mg/m³)	1.5 mg/m³ (inhalable particulate matter)
Nova Scotia	OEL TWA (mg/m³)	1.5 mg/m³ (inhalable particulate matter)
Nunavut	OEL STEL (mg/m³)	3 mg/m³ (inhalable fraction)
Nunavut	OEL TWA (mg/m³)	1.5 mg/m³ (inhalable fraction)
Northwest Territories	OEL STEL (mg/m³)	3 mg/m³ (inhalable fraction)
Northwest Territories	OEL TWA (mg/m³)	1.5 mg/m³ (inhalable fraction)
Ontario	OEL TWA (mg/m³)	1 mg/m³ (inhalable)
Prince Edward Island	OEL TWA (mg/m³)	1.5 mg/m³ (inhalable particulate matter)
Québec	VEMP (mg/m³)	1 mg/m³
Saskatchewan	OEL STEL (mg/m³)	3 mg/m³ (inhalable fraction)
Saskatchewan	OEL TWA (mg/m³)	1.5 mg/m³ (inhalable fraction)
Yukon	OEL STEL (mg/m³)	3 mg/m³
Yukon	OEL TWA (mg/m³)	1 mg/m³

Chromium (7440-47-3)		
USA ACGIH	ACGIH TWA (mg/m³)	0.5 mg/m³
USA ACGIH	ACGIH chemical category	Not Classifiable as a Human Carcinogen
USA OSHA	OSHA PEL (TWA) (mg/m³)	1 mg/m³
USA NIOSH	NIOSH REL (TWA) (mg/m³)	0.5 mg/m³
USA IDLH	US IDLH (mg/m³)	250 mg/m³
Alberta	OEL TWA (mg/m³)	0.5 mg/m³
British Columbia	OEL TWA (mg/m³)	0.5 mg/m³
Manitoba	OEL TWA (mg/m³)	0.5 mg/m³
New Brunswick	OEL TWA (mg/m³)	0.5 mg/m³
Newfoundland & Labrador	OEL TWA (mg/m³)	0.5 mg/m³
Nova Scotia	OEL TWA (mg/m³)	0.5 mg/m³
Nunavut	OEL STEL (mg/m³)	1.5 mg/m³ (metal)
Nunavut	OEL TWA (mg/m³)	0.5 mg/m³ (metal)
Northwest Territories	OEL STEL (mg/m³)	1.5 mg/m³ (metal)
Northwest Territories	OEL TWA (mg/m³)	0.5 mg/m³ (metal)
Ontario	OEL TWA (mg/m³)	0.5 mg/m³
Prince Edward Island	OEL TWA (mg/m³)	0.5 mg/m³
Québec	VEMP (mg/m³)	0.5 mg/m³
Saskatchewan	OEL STEL (mg/m³)	1.5 mg/m³
Saskatchewan	OEL TWA (mg/m³)	0.5 mg/m³
Yukon	OEL STEL (mg/m³)	3 mg/m³
Yukon	OEL TWA (mg/m³)	0.1 mg/m³

Manganese (7439-96-5)		
USA ACGIH	ACGIH TWA (mg/m³)	0.02 mg/m³ (respirable particulate matter) 0.1 mg/m³ (inhalable particulate matter)
USA ACGIH	ACGIH chemical category	Not Classifiable as a Human Carcinogen
USA OSHA	OSHA PEL (Ceiling) (mg/m³)	5 mg/m³ (fume)
USA NIOSH	NIOSH REL (TWA) (mg/m³)	1 mg/m³ (fume)
USA NIOSH	NIOSH REL (STEL) (mg/m³)	3 mg/m³
USA IDLH	US IDLH (mg/m³)	500 mg/m³
Alberta	OEL TWA (mg/m³)	0.2 mg/m³
British Columbia	OEL TWA (mg/m³)	0.2 mg/m³
Manitoba	OEL TWA (mg/m³)	0.02 mg/m³ (respirable particulate matter) 0.1 mg/m³ (inhalable particulate matter)
New Brunswick	OEL TWA (mg/m³)	0.2 mg/m³
Newfoundland & Labrador	OEL TWA (mg/m³)	0.02 mg/m³ (respirable particulate matter) 0.1 mg/m³ (inhalable particulate matter)
Nova Scotia	OEL TWA (mg/m³)	0.02 mg/m³ (respirable particulate matter)

		0.1 mg/m³ (inhalable particulate matter)
Nunavut	OEL STEL (mg/m³)	0.6 mg/m³
Nunavut	OEL TWA (mg/m³)	0.2 mg/m³
Northwest Territories	OEL STEL (mg/m³)	0.6 mg/m³
Northwest Territories	OEL TWA (mg/m³)	0.2 mg/m³
Ontario	OEL TWA (mg/m³)	0.2 mg/m³
Prince Edward Island	OEL TWA (mg/m³)	0.02 mg/m³ (respirable particulate matter) 0.1 mg/m³ (inhalable particulate matter)
Québec	VEMP (mg/m³)	0.2 mg/m³ (total dust and fume)
Saskatchewan	OEL STEL (mg/m³)	0.6 mg/m³
Saskatchewan	OEL TWA (mg/m³)	0.2 mg/m³
Yukon	OEL Ceiling (mg/m³)	5 mg/m³
Molybdenum (7439-98-7)		
	Internal TWA (mg/m³)	5 mg/m³ (Molybdenum (as Mo), Soluble Compounds)
USA ACGIH	ACGIH TWA (mg/m³)	10 mg/m³ (inhalable particulate matter) 3 mg/m³ (respirable particulate matter)
USA OSHA	OSHA PEL (TWA) (mg/m³)	5 mg/m³ (Molybdenum (as Mo), Soluble Compounds) 15 mg/m³ (Molybdenum (as Mo), Insoluble Compounds (Total dust)
USA NIOSH	NIOSH REL (TWA) (mg/m³)	5 mg/m³ (Molybdenum (as Mo), Soluble Compounds)
USA IDLH	US IDLH (mg/m³)	5000 mg/m³
Alberta	OEL TWA (mg/m³)	10 mg/m³ (total) 3 mg/m³ (respirable)
British Columbia	OEL TWA (mg/m³)	3 mg/m³ (respirable) 10 mg/m³ (inhalable)
Manitoba	OEL TWA (mg/m³)	3 mg/m³ (respirable particulate matter) 10 mg/m³ (inhalable particulate matter)
Newfoundland & Labrador	OEL TWA (mg/m³)	3 mg/m³ (respirable particulate matter) 10 mg/m³ (inhalable particulate matter)
Nova Scotia	OEL TWA (mg/m³)	3 mg/m³ (respirable particulate matter) 10 mg/m³ (inhalable particulate matter)
Nunavut	OEL STEL (mg/m³)	20 mg/m³ (metal-inhalable fraction) 6 mg/m³ (metal-respirable fraction)
Nunavut	OEL TWA (mg/m³)	10 mg/m³ (metal-inhalable fraction) 3 mg/m³ (metal-respirable fraction)
Northwest Territories	OEL STEL (mg/m³)	20 mg/m³ (metal-inhalable fraction) 6 mg/m³ (metal-respirable fraction)
Northwest Territories	OEL TWA (mg/m³)	10 mg/m³ (metal-inhalable fraction) 3 mg/m³ (metal-respirable fraction)
Ontario	OEL TWA (mg/m³)	10 mg/m³ (metal-inhalable) 3 mg/m³ (metal-respirable)
Prince Edward Island	OEL TWA (mg/m³)	3 mg/m³ (respirable particulate matter) 10 mg/m³ (inhalable particulate matter)
Saskatchewan	OEL STEL (mg/m³)	20 mg/m³ (inhalable fraction) 6 mg/m³ (respirable fraction)
Saskatchewan	OEL TWA (mg/m³)	10 mg/m³ (inhalable fraction) 3 mg/m³ (respirable fraction)
Silicon (7440-21-3)		
USA OSHA	OSHA PEL (TWA) (mg/m³)	15 mg/m³ (total dust) 5 mg/m³ (respirable fraction)
USA NIOSH	NIOSH REL (TWA) (mg/m³)	10 mg/m³ (total dust) 5 mg/m³ (respirable dust)

British Columbia	OEL TWA (mg/m³)	10 mg/m³ (total dust) 3 mg/m³ (respirable fraction)
New Brunswick	OEL TWA (mg/m³)	10 mg/m³
Nunavut	OEL STEL (mg/m³)	20 mg/m³
Nunavut	OEL TWA (mg/m³)	10 mg/m³
Northwest Territories	OEL STEL (mg/m³)	20 mg/m³
Northwest Territories	OEL TWA (mg/m³)	10 mg/m³
Québec	VEMP (mg/m³)	10 mg/m³ (containing no Asbestos and <1% Crystalline silica-total dust)
Saskatchewan	OEL STEL (mg/m³)	20 mg/m³
Saskatchewan	OEL TWA (mg/m³)	10 mg/m³
Yukon	OEL STEL (mg/m³)	20 mg/m³
Yukon	OEL TWA (mg/m³)	30 mppcf 10 mg/m³

Copper (7440-50-8)		
USA ACGIH	ACGIH TWA (mg/m³)	0.2 mg/m³ (fume)
USA OSHA	OSHA PEL (TWA) (mg/m³)	0.1 mg/m³ (fume) 1 mg/m³ (dust and mist)
USA NIOSH	NIOSH REL (TWA) (mg/m³)	1 mg/m³ (dust and mist) 0.1 mg/m³ (fume)
USA IDLH	US IDLH (mg/m³)	100 mg/m³ (dust, fume and mist)
Alberta	OEL TWA (mg/m³)	0.2 mg/m³ (fume) 1 mg/m³ (dust and mist)
British Columbia	OEL TWA (mg/m³)	1 mg/m³ (dust and mist) 0.2 mg/m³ (fume)
Manitoba	OEL TWA (mg/m³)	0.2 mg/m³ (fume)
New Brunswick	OEL TWA (mg/m³)	0.2 mg/m³ (fume) 1 mg/m³ (dust and mist)
Newfoundland & Labrador	OEL TWA (mg/m³)	0.2 mg/m³ (fume)
Nova Scotia	OEL TWA (mg/m³)	0.2 mg/m³ (fume)
Nunavut	OEL STEL (mg/m³)	3 mg/m³ (dust and mist) 0.6 mg/m³ (fume)
Nunavut	OEL TWA (mg/m³)	0.2 mg/m³ (fume) 1 mg/m³ (dust and mist)
Northwest Territories	OEL STEL (mg/m³)	3 mg/m³ (dust and mist) 0.6 mg/m³ (fume)
Northwest Territories	OEL TWA (mg/m³)	0.2 mg/m³ (fume) 1 mg/m³ (dust and mist)
Ontario	OEL TWA (mg/m³)	0.2 mg/m³ (fume) 1 mg/m³ (dust and mist)
Prince Edward Island	OEL TWA (mg/m³)	0.2 mg/m³ (fume)
Québec	VEMP (mg/m³)	0.2 mg/m³ (fume) 1 mg/m³ (dust and mist)
Saskatchewan	OEL STEL (mg/m³)	0.6 mg/m³ (fume) 3 mg/m³ (dust and mist)
Saskatchewan	OEL TWA (mg/m³)	0.2 mg/m³ (fume) 1 mg/m³ (dust and mist)
Yukon	OEL STEL (mg/m³)	0.2 mg/m³ (fume) 2 mg/m³ (dust and mist)
Yukon	OEL TWA (mg/m³)	0.2 mg/m³ (fume) 1 mg/m³ (dust and mist)

Cobalt (7440-48-4)

USA ACGIH	ACGIH TWA (mg/m³)	0.02 mg/m³
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/m³)	0.1 mg/m³ (dust and fume)
USA NIOSH	NIOSH REL (TWA) (mg/m³)	0.05 mg/m³ (dust and fume)
USA IDLH	US IDLH (mg/m³)	20 mg/m³ (dust and fume)
Alberta	OEL TWA (mg/m³)	0.02 mg/m³
British Columbia	OEL TWA (mg/m³)	0.02 mg/m³
Manitoba	OEL TWA (mg/m³)	0.02 mg/m³
New Brunswick	OEL TWA (mg/m³)	0.02 mg/m³
Newfoundland & Labrador	OEL TWA (mg/m³)	0.02 mg/m³
Nova Scotia	OEL TWA (mg/m³)	0.02 mg/m³
Nunavut	OEL STEL (mg/m³)	0.06 mg/m³
Nunavut	OEL TWA (mg/m³)	0.02 mg/m³
Northwest Territories	OEL STEL (mg/m³)	0.06 mg/m³
Northwest Territories	OEL TWA (mg/m³)	0.02 mg/m³
Ontario	OEL TWA (mg/m³)	0.02 mg/m³
Prince Edward Island	OEL TWA (mg/m³)	0.02 mg/m³
Québec	VEMP (mg/m³)	0.02 mg/m³
Saskatchewan	OEL STEL (mg/m³)	0.06 mg/m³
Saskatchewan	OEL TWA (mg/m³)	0.02 mg/m³
Yukon	OEL STEL (mg/m³)	0.15 mg/m³ (dust and fume)
Yukon	OEL TWA (mg/m³)	0.05 mg/m³ (dust and fume)

Tungsten (7440-33-7)		
USA ACGIH	ACGIH TWA (mg/m³)	3 mg/m³ (respirable particulate matter)
USA NIOSH	NIOSH REL (TWA) (mg/m³)	5 mg/m³
USA NIOSH	NIOSH REL (STEL) (mg/m³)	10 mg/m³
Alberta	OEL STEL (mg/m³)	10 mg/m³
Alberta	OEL TWA (mg/m³)	5 mg/m³
British Columbia	OEL STEL (mg/m³)	10 mg/m³
British Columbia	OEL TWA (mg/m³)	5 mg/m³
Manitoba	OEL TWA (mg/m³)	3 mg/m³ (respirable particulate matter)
Newfoundland & Labrador	OEL TWA (mg/m³)	3 mg/m³ (respirable particulate matter)
Nova Scotia	OEL TWA (mg/m³)	3 mg/m³ (respirable particulate matter)
Nunavut	OEL STEL (mg/m³)	10 mg/m³
Nunavut	OEL TWA (mg/m³)	5 mg/m³
Northwest Territories	OEL STEL (mg/m³)	10 mg/m³
Northwest Territories	OEL TWA (mg/m³)	5 mg/m³
Ontario	OEL STEL (mg/m³)	10 mg/m³
Ontario	OEL TWA (mg/m³)	5 mg/m³
Prince Edward Island	OEL TWA (mg/m³)	3 mg/m³ (respirable particulate matter)
Saskatchewan	OEL STEL (mg/m³)	10 mg/m³
Saskatchewan	OEL TWA (mg/m³)	5 mg/m³
Yukon	OEL STEL (mg/m³)	10 mg/m³
Yukon	OEL TWA (mg/m³)	5 mg/m³

Aluminum (7429-90-5)		
USA ACGIH	ACGIH TWA (mg/m³)	1 mg/m³ (respirable particulate matter)
USA ACGIH	ACGIH chemical category	Not Classifiable as a Human Carcinogen
USA OSHA	OSHA PEL (TWA) (mg/m³)	15 mg/m³ (total dust) 5 mg/m³ (respirable fraction)

USA NIOSH	NIOSH REL (TWA) (mg/m³)	10 mg/m³ (total dust) 5 mg/m³ (respirable dust)
Alberta	OEL TWA (mg/m³)	10 mg/m³ (dust)
British Columbia	OEL TWA (mg/m³)	1 mg/m³ (respirable)
Manitoba	OEL TWA (mg/m³)	1 mg/m³ (respirable particulate matter)
New Brunswick	OEL TWA (mg/m³)	10 mg/m³ (metal dust)
Newfoundland & Labrador	OEL TWA (mg/m³)	1 mg/m³ (respirable particulate matter)
Nova Scotia	OEL TWA (mg/m³)	1 mg/m³ (respirable particulate matter)
Nunavut	OEL STEL (mg/m³)	20 mg/m³ (metal-dust)
Nunavut	OEL TWA (mg/m³)	10 mg/m³ (metal-dust)
Northwest Territories	OEL STEL (mg/m³)	20 mg/m³ (metal-dust)
Northwest Territories	OEL TWA (mg/m³)	10 mg/m³ (metal-dust)
Ontario	OEL TWA (mg/m³)	1 mg/m³ (respirable)
Prince Edward Island	OEL TWA (mg/m³)	1 mg/m³ (respirable particulate matter)
Québec	VEMP (mg/m³)	10 mg/m³
Saskatchewan	OEL STEL (mg/m³)	20 mg/m³ (dust)
Saskatchewan	OEL TWA (mg/m³)	10 mg/m³ (dust)

Vanadium (7440-62-2)		
USA OSHA	OSHA PEL (Ceiling) (mg/m³)	0.5 mg/m³ (respirable dust) 0.1 mg/m³ (fume)
USA NIOSH	NIOSH REL (TWA) (mg/m³)	1 mg/m³
USA NIOSH	NIOSH REL (STEL) (mg/m³)	3 mg/m³

Tantalum (7440-25-7)		
USA OSHA	OSHA PEL (TWA) (mg/m³)	5 mg/m³
USA NIOSH	NIOSH REL (TWA) (mg/m³)	5 mg/m³ (dust)
USA NIOSH	NIOSH REL (STEL) (mg/m³)	10 mg/m³ (dust)
USA IDLH	US IDLH (mg/m³)	2500 mg/m³ (dust)
Alberta	OEL TWA (mg/m³)	5 mg/m³ (dust)
British Columbia	OEL TWA (mg/m³)	5 mg/m³
New Brunswick	OEL TWA (mg/m³)	5 mg/m³ (dust)
Nunavut	OEL STEL (mg/m³)	10 mg/m³ (metal)
Nunavut	OEL TWA (mg/m³)	5 mg/m³ (metal)
Northwest Territories	OEL STEL (mg/m³)	10 mg/m³ (metal)
Northwest Territories	OEL TWA (mg/m³)	5 mg/m³ (metal)
Québec	VEMP (mg/m³)	5 mg/m³ (dust)
Saskatchewan	OEL STEL (mg/m³)	10 mg/m³
Saskatchewan	OEL TWA (mg/m³)	5 mg/m³
Yukon	OEL STEL (mg/m³)	10 mg/m³
Yukon	OEL TWA (mg/m³)	5 mg/m³

Lead (7439-92-1)		
USA ACGIH	ACGIH TWA (mg/m³)	0.05 mg/m³
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/m³)	50 µg/m³
USA NIOSH	NIOSH REL (TWA) (mg/m³)	0.05 mg/m³
USA IDLH	US IDLH (mg/m³)	100 mg/m³
Alberta	OEL TWA (mg/m³)	0.05 mg/m³

British Columbia	OEL TWA (mg/m³)	0.05 mg/m³
Manitoba	OEL TWA (mg/m³)	0.05 mg/m³
New Brunswick	OEL TWA (mg/m³)	0.05 mg/m³
Newfoundland & Labrador	OEL TWA (mg/m³)	0.05 mg/m³
Nova Scotia	OEL TWA (mg/m³)	0.05 mg/m³
Nunavut	OEL STEL (mg/m³)	0.15 mg/m³
Nunavut	OEL TWA (mg/m³)	0.05 mg/m³
Northwest Territories	OEL STEL (mg/m³)	0.15 mg/m³
Northwest Territories	OEL TWA (mg/m³)	0.05 mg/m³
Ontario	OEL TWA (mg/m³)	0.05 mg/m³ (designated substances regulation) 0.05 mg/m³ (applies to workplaces to which the designated substances regulation does not apply)
Prince Edward Island	OEL TWA (mg/m³)	0.05 mg/m³
Québec	VEMP (mg/m³)	0.05 mg/m³
Saskatchewan	OEL STEL (mg/m³)	0.15 mg/m³
Saskatchewan	OEL TWA (mg/m³)	0.05 mg/m³
Yukon	OEL STEL (mg/m³)	0.45 mg/m³ (dust and fume)
Yukon	OEL TWA (mg/m³)	0.15 mg/m³ (dust and fume)

Paraffin oils (8012-95-1)		
USA ACGIH	ACGIH TWA (mg/m³)	5 mg/m³ (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/m³)	5 mg/m³
USA NIOSH	NIOSH REL (TWA) (mg/m³)	5 mg/m³
USA NIOSH	NIOSH REL (STEL) (mg/m³)	10 mg/m³
USA IDLH	US IDLH (mg/m³)	2500 mg/m³
Alberta	OEL STEL (mg/m³)	10 mg/m³
Alberta	OEL TWA (mg/m³)	5 mg/m³
British Columbia	OEL TWA (mg/m³)	0.2 mg/m³ (mildly refined) 1 mg/m³ (severely refined)
Manitoba	OEL TWA (mg/m³)	5 mg/m³ (excluding metal working fluids, highly & severely refined-inhalable particulate matter)
New Brunswick	OEL STEL (mg/m³)	10 mg/m³
New Brunswick	OEL TWA (mg/m³)	5 mg/m³ (as sampled by a method that does not collect vapor)
Newfoundland & Labrador	OEL TWA (mg/m³)	5 mg/m³ (excluding metal working fluids, highly & severely refined-inhalable particulate matter)
Nova Scotia	OEL TWA (mg/m³)	5 mg/m³ (excluding metal working fluids, highly & severely refined-inhalable particulate matter)
Nunavut	OEL STEL (mg/m³)	10 mg/m³
Nunavut	OEL TWA (mg/m³)	5 mg/m³
Northwest Territories	OEL STEL (mg/m³)	10 mg/m³
Northwest Territories	OEL TWA (mg/m³)	5 mg/m³
Ontario	OEL TWA (mg/m³)	5 mg/m³ (pure, highly and severely refined, excluding metal working fluids-inhalable)
Prince Edward Island	OEL TWA (mg/m³)	5 mg/m³ (excluding metal working fluids, highly & severely refined-inhalable particulate matter)
Québec	VECD (mg/m³)	10 mg/m³ (mist)
Québec	VEMP (mg/m³)	5 mg/m³ (mist)
Saskatchewan	OEL STEL (mg/m³)	10 mg/m³

Saskatchewan	OEL TWA (mg/m³)	5 mg/m³
Yukon	OEL STEL (mg/m³)	10 mg/m³
Yukon	OEL TWA (mg/m³)	5 mg/m³
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/m³)	10 mg/m³

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

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),

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

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

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

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.

Nickel (7440-02-0)	
U.S. - California - Proposition 65 - Carcinogens List	WARNING: This product contains chemicals known to the State of California to cause cancer.

Cobalt (7440-48-4)	
U.S. - California - Proposition 65 - Carcinogens List	WARNING: This product contains chemicals known to the State of California to cause cancer.

Lead (7439-92-1)	
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.

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)

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)

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 Revision : 10/25/2017

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.

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.

NA GHS SDS 2015 (Can, US)

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

- Trade name Radel® R-5500 NT 15

1.2 Relevant identified uses of the substance or mixture and uses advised against

Uses of the Substance / Mixture

- Plastics industry

1.3 Details of the supplier of the safety data sheet

Company

SOLVAY SPECIALTY POLYMERS USA, LLC
4500 McGINNIS FERRY ROAD
30005-3914, ALPHARETTA
USA
Tel: +1-770-7728200
Fax: +1-770-7728213
Product information:
+1-800-6214557

1.4 Emergency telephone

FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT CONTACT: CHEMTREC 800-424-9300 within the United States and Canada, or 703-527-3887 for international collect calls.

SECTION 2: Hazards identification

Although OSHA has not adopted the environmental portion of the GHS regulations, this document may include information on environmental effects.

2.1 Classification of the substance or mixture

HCS 2012 (29 CFR 1910.1200)

Combustible dust	May form combustible dust concentrations in air.

2.2 Label elements

HCS 2012 (29 CFR 1910.1200)

Signal Word

- Warning

Hazard Statements

- May form combustible dust concentrations in air.

2.3 Other hazards which do not result in classification

- This product as shipped is not a combustible dust, however if small particles are generated during further processing, handling or by other means, combustible dust concentrations may form in the air.

SECTION 3: Composition/information on ingredients

3.1 Substance

- Not applicable, this product is a mixture.

3.2 Mixture

Hazardous Ingredients and Impurities

Chemical Name	Identification number CAS-No.	Concentration [%]
Titanium oxide (TiO2)	13463-67-7	1 - 5

The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

Non Hazardous Ingredients and Impurities

Chemical Name	Identification number CAS-No.	Concentration [%]
Polyphenylsulfone	25608-64-4	>= 88

SECTION 4: First aid measures

4.1 Description of first-aid measures

In case of inhalation

- Remove to fresh air.
- If symptoms persist, call a physician.

In case of skin contact

- Wash off with soap and water.
- Wash contaminated clothing before re-use.
- If symptoms persist, call a physician.
- Cool skin rapidly with cold water after contact with hot polymer.
- Do not peel polymer from the skin.
- Obtain medical attention.

In case of eye contact

- Flush eyes with running water for several minutes, while keeping the eyelids wide open.
- If eye irritation persists, consult a specialist.

In case of ingestion

- Never give anything by mouth to an unconscious person.
- If a large amount is swallowed, get medical attention.

4.2 Most important symptoms and effects, both acute and delayed

In case of inhalation

Effects

- Mechanical irritation from the particulates generated by the product.
- Thermal decomposition can lead to release of hazardous gases and vapors

In case of skin contact

Effects

- Mechanical irritation from the particulates generated by the product.

In case of eye contact

Effects

- Mechanical irritation from the particulates generated by the product.

In case of ingestion

Effects

- Low ingestion hazard.

4.3 Indication of any immediate medical attention and special treatment needed

- no data available

SECTION 5: Firefighting measures

Flash point	Not applicable
Autoignition temperature	no data available
Flammability / Explosive limit	no data available

5.1 Extinguishing media

Suitable extinguishing media

- powder
- Foam
- Water
- Water spray
- Carbon dioxide (CO2)

Unsuitable extinguishing media

- None known.

5.2 Special hazards arising from the substance or mixture

- Combustible material
- In a fire, the polymer melts, producing droplets which may propagate fire.
- Once started, a fire will tend to self extinguish (see section 9).
- Heating can release hazardous gases.

5.3 Advice for firefighters

Special protective equipment for fire-fighters

- In the event of fire, wear self-contained breathing apparatus.
- Fire fighters must wear fire resistant personnel protective equipment.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel

- Refer to protective measures listed in sections 7 and 8.

Advice for emergency responders

- Sweep up to prevent slipping hazard.
- Avoid dust formation.
- Refer to protective measures listed in sections 7 and 8.

6.2 Environmental precautions

- Should not be released into the environment.
- The product should not be allowed to enter drains, water courses or the soil.
- In case of accidental release or spill, immediately notify the appropriate authorities if required by Federal, State/Provincial and local laws and regulations.

6.3 Methods and materials for containment and cleaning up

- Sweep up and shovel into suitable containers for disposal.
- Avoid dust formation.
- Keep in properly labeled containers.
- Keep in suitable, closed containers for disposal.
- Treat recovered material as described in the section "Disposal considerations".

6.4 Reference to other sections

- Refer to protective measures listed in sections 7 and 8.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

- Take measures to prevent the build up of electrostatic charge.
- Ensure all equipment is electrically grounded before beginning transfer operations.
- Use only equipment and materials which are compatible with the product.
- To avoid thermal decomposition, do not overheat.

Hygiene measures

- Wash hands before breaks and at the end of workday.
- Handle in accordance with good industrial hygiene and safety practice.

Dust explosion class

- St1

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/Storage conditions

- Keep container tightly closed.
- Keep away from heat and sources of ignition.
- Keep away from open flames, hot surfaces and sources of ignition.
- To avoid thermal decomposition, do not overheat.
- Avoid dust formation.
- Do not smoke.
- Refer to protective measures listed in sections 7 and 8.

7.3 Specific end use(s)

- For further information, please contact:
- Supplier

SECTION 8: Exposure controls/personal protection

Introductory Remarks: These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

8.1 Control parameters

Components with workplace occupational exposure limits

Ingredients	Value type	Value	Basis
Particles not otherwise specified (PNOS)			National Institute for Occupational Safety and Health
	Includes all inert or nuisance dusts, whether mineral, inorganic, not listed specifically in 1910.1000., See Appendix D - Substances with No Established RELs		
Particles not otherwise specified (PNOS)	TWA	15 mg/m3	Occupational Safety and Health Administration - Table Z-1 Limits for Air Contaminants
	Form of exposure : total dust All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit which is the same as the inert or nuisance dust limit of Table Z-3.		
Particles not otherwise specified (PNOS)	TWA	5 mg/m3	Occupational Safety and Health Administration - Table Z-1 Limits for Air Contaminants
	Form of exposure : respirable fraction All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit which is the same as the inert or nuisance dust limit of Table Z-3.		
Particles not otherwise specified (PNOS)	TWA	10 mg/m3	American Conference of Governmental Industrial Hygienists
	Form of exposure : Inhalable fraction		
Particles not otherwise specified (PNOS)	TWA	3 mg/m3	American Conference of Governmental Industrial Hygienists
	Form of exposure : Respirable fraction		
Titanium oxide (TiO2)			National Institute for Occupational Safety and Health
	Potential Occupational Carcinogen, See Appendix A		
Titanium oxide (TiO2)	TWA	15 mg/m3	Occupational Safety and Health Administration - Table Z-1 Limits for Air Contaminants
	Form of exposure : total dust		
Titanium oxide (TiO2)	TWA	10 mg/m3	American Conference of Governmental Industrial Hygienists
	Expressed as :Titanium dioxide		

NIOSH IDLH (Immediately Dangerous to Life or Health Concentrations)

Ingredients	CAS-No.	Concentration
Titanium oxide (TiO2)	13463-67-7	5000 milligram per cubic meter

8.2 Exposure controls

Control measures

Engineering measures
- Provide local ventilation appropriate to the product decomposition risk (see section 10).
- Provide appropriate exhaust ventilation at places where dust is formed.
- Refer to protective measures listed in sections 7 and 8.

Individual protection measures

Respiratory protection
- When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
- Use only respiratory protection that conforms to international/ national standards.
- Use NIOSH approved respiratory protection.

Hand protection
- When handling hot material, use heat resistant gloves.

Eye protection
- Safety glasses with side-shields
- Dust proof goggles, if dusty.

Skin and body protection
- Long sleeved clothing

Hygiene measures
- Wash hands before breaks and at the end of workday.
- Handle in accordance with good industrial hygiene and safety practice.

Protective measures
- When using do not eat, drink or smoke.

SECTION 9: Physical and chemical properties

Physical and Chemical properties here represent typical properties of this product. Contact the business area using the Product information phone number in Section 1 for its exact specifications.

9.1 Information on basic physical and chemical properties

Appearance	Form:	pellets
	Physical state:	solid
	Color:	white
Odor	odorless	
Odor Threshold	no data available	
pH	Not applicable	

Softening point	428 °F (220 °C)
Boiling point/boiling range	Not applicable
Flash point	Not applicable
Evaporation rate (Butylacetate = 1)	no data available
Flammability (solid, gas)	May form combustible dust concentrations in air., The product is not flammable.
Flammability / Explosive limit	no data available
Autoignition temperature	no data available
Vapor pressure	Not applicable
Vapor density	Not applicable
Density	no data available
Solubility	Water solubility : negligible
Partition coefficient: n-octanol/water	Not applicable
Thermal decomposition	> 806 °F (430 °C) Extended period of exposure (ca. 1 hour).
Viscosity	no data available
Explosive properties	no data available
Oxidizing properties	no data available

9.2 Other information

Dust explosion constant	34 m.bar/s St1
Minimum ignition energy	300 - 1,000 mJ

SECTION 10: Stability and reactivity

10.1 Reactivity

- No dangerous reaction known under conditions of normal use.

10.2 Chemical stability

- Stable under normal conditions.

10.3 Possibility of hazardous reactions

- No dangerous reaction known under conditions of normal use.

Polymerization
- Hazardous polymerization does not occur.

10.4 Conditions to avoid

- Heat, flames and sparks.
- To avoid thermal decomposition, do not overheat.
- Avoid dust formation.
- The normal temperature for processing this resin exceeds the decomposition and/or ignition temperature of some other polymeric resins, such as polyacetal, polyvinyl chloride (PVC), polypropylene, etc. If PVC or any other resin with a decomposition temperature below 371°C / 700°F is molded or handled in your equipment, these materials can rapidly decompose and/or react with this resin at the temperatures used to process this resin. Inadvertent contamination of this resin with these materials from the material handling system or other equipment can result in a rapid, possibly violent release of decomposition fumes, when the contaminated material is brought to processing temperature. To avoid, thoroughly clean molding and other processing equipment prior to changeover and prevent cross contamination of material handling systems.

10.5 Incompatible materials

- Polymeric resins

10.6 Hazardous decomposition products

- Carbon monoxide
- Sulfur oxides
- Hydrocarbons
- The release of other hazardous decomposition products is possible.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Acute oral toxicity	no data available
Acute inhalation toxicity	no data available
Acute dermal toxicity	no data available
Acute toxicity (other routes of administration)	no data available
Skin corrosion/irritation	no data available
Serious eye damage/eye irritation	no data available
Respiratory or skin sensitization	no data available

Mutagenicity

Genotoxicity in vitro	no data available

Genotoxicity in vivo no data available

Carcinogenicity

Dust causes lung tumors in rats.
Not classifiable as a human carcinogen.
Lung tumors observed in rat following long-term inhalation exposure to poorly soluble particles of low toxicity are the result of a species-specific mechanism known as “lung overload”. The formation of tumors is not observed in other species under similar exposure conditions and is considered not predictive of the effects in humans.
Note: IARC Classification: Group 2B

Ingredients	CAS-No.	Rating	Basis
Titanium oxide (TiO2)	13463-67-7	Group 2B: Possibly carcinogenic to humans	IARC

This product does not contain any ingredient designated as probable or suspected human carcinogens by:
NTP
OSHA
ACGIH

Toxicity for reproduction and development

Toxicity to reproduction / fertility no data available

Developmental Toxicity/Teratogenicity no data available

STOT

STOT-single exposure no data available

STOT-repeated exposure no data available

CMR effects

Carcinogenicity

Not classified as a carcinogen according to GHS criteria: the mechanism or mode of action of tumour formation is considered not relevant for humans.
The product is not considered to be carcinogenic.

Aspiration toxicity no data available

Further information

Because the components are encapsulated in the resin and may not be bioavailable in the body, they may not exert the above mentioned health effects.
Description of possible hazardous to health effects is based on experience and/or toxicological characteristics of several ingredients.

SECTION 12: Ecological information

12.1 Toxicity no data available

12.2 Persistence and degradability	no data available
12.3 Bioaccumulative potential	no data available
12.4 Mobility in soil	no data available
12.5 Results of PBT and vPvB assessment	no data available
12.6 Other adverse effects	no data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product Disposal

- In accordance with local and national regulations.
- Waste characterizations and compliance with applicable laws and regulations are the responsibility of the waste generator.
- Must be incinerated in a suitable incineration plant holding a permit delivered by the competent authorities.
- Can be landfilled or incinerated, when in compliance with local regulations.

- Do not dump into any sewers, on the ground, or into any body of water. All disposal methods must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations.

Advice on cleaning and disposal of packaging

- Empty containers.
- Dispose of as unused product.
- For unused and uncontaminated product, the preferred options include sending to a licensed, permitted: recycler, reclaimer, incinerator or other thermal destruction device or industrial landfill.

SECTION 14: Transport information

DOT
not regulated

TDG
not regulated

NOM
not regulated

IMDG
not regulated

IATA
not regulated

Note: The above regulatory prescriptions are those valid on the date of publication of this sheet. Given the possible evolution of transportation regulations for hazardous materials, it would be advisable to check their validity with your sales office.

SECTION 15: Regulatory information

15.1 Notification status

Inventory Information	Status
United States TSCA Inventory	- Listed on Inventory
Australia Inventory of Chemical Substances (AICS)	- Listed on Inventory
Canadian Domestic Substances List (DSL)	- Listed on Inventory
Japan. CSCL - Inventory of Existing and New Chemical Substances	- Listed on Inventory
Korea. Korean Existing Chemicals Inventory (KECI)	- Listed on Inventory
Philippines Inventory of Chemicals and Chemical Substances (PICCS)	- Listed on Inventory
China. Inventory of Existing Chemical Substances in China (IECSC)	- Listed on Inventory
EU. European Registration, Evaluation, Authorisation and Restriction of Chemical (REACH)	- If product is purchased from Solvay in Europe it is in compliance with REACH, if not please contact the supplier.

15.2 Federal Regulations

US. EPA EPCRA SARA Title III

Section 313 Toxic Chemicals (40 CFR 372.65)
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Section 302 Emergency Planning Extremely Hazardous Substance Threshold Planning Quantity (40 CFR 355)
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

Section 302 Emergency Planning Extremely Hazardous Substance Reportable Quantity (40 CFR 355)
This material does not contain any components with a SARA 302 RQ.

Section 304 Emergency Release Notification Reportable Quantity (40 CFR 355)
This material does not contain any components with a section 304 EHS RQ.

US. EPA CERCLA Hazardous Substances and Reportable Quantities (40 CFR 302.4)

This material does not contain any components with a CERCLA RQ.

15.3 State Regulations

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)

WARNING! This product contains a chemical known in the State of California to cause cancer.

Ingredients	CAS-No.
Titanium oxide (TiO2)	13463-67-7

SECTION 16: Other information

Further information

- Product evaluated under the US GHS format.

Date Prepared: 05/28/2015

Key or legend to abbreviations and acronyms used in the safety data sheet

- TWA	8-hour, time-weighted average
- ACGIH	American Conference of Governmental Industrial Hygienists
- OSHA	Occupational Safety and Health Administration
- NTP	National Toxicology Program
- IARC	International Agency for Research on Cancer
- NIOSH	National Institute for Occupational Safety and Health