

STAINLESS STEEL POWDER

Safety Data Sheet (SDS)

Section 1 Chemical Product and Company Identification				
Description	Stainless Steel Powder SM400281R, SM400285R, SM400280R		CAS Number:	Mixture
Other means of identifier:	None			
Supplier's Information:	EnvironMolds LLC 18 Bank Street / Suite 1 Summit, NJ 07901		Contact Number:	908-273-5401
Section 2 Hazards Identification				
<p>Stainless steel is not hazardous according to the criteria specified in European Directives 67/548/EEC and 1999/45/EC. Solid metallic products are classified as "articles" and are not hazardous material under the definitions of OSHA Hazard Communication Standard (29 CFR 1910.1200).</p> <p>Stainless steel products in their solid state present no inhalation, ingestion or contact health hazard. However, inhaling dusts fumes or mists which may be generated during certain manufacturing procedures such as burning, melting, welding, sawing, brazing, grinding and machining may be hazardous to your health. Dusts may also be irritating to the unprotected skin and eyes.</p> <p>Short Term exposure to fumes/dust generated from stainless steel use and processing may produce irritation of the eyes and respiratory system. Inhalation of high concentrations of freshly formed oxide fumes of iron, manganese and copper may cause metal fume fever, characterized by a metallic taste in the mouth, dryness and irritation of the throat and influenza-like symptoms.</p> <p>Chronic inhalation of high concentrations of iron oxide fumes or dust may lead to a benign pneumoconiosis (siderosis). Inhalation of high concentrations of ferric oxide may possibly have a synergistic effect and increase the risk of lung cancer development in workers exposed to pulmonary carcinogens.</p> <p>Chromium and nickel and their compounds are listed in NTP's 7th Annual Report on Carcinogens. Exposure to dust and fumes can cause sensitization dermatitis, inflammation and/or ulceration of upper respiratory tract, and cancer of nasal passages and lungs.</p> <p>NTP classifies nickel metal and certain nickel compounds as "reasonably anticipated to be carcinogens." IARC classifies nickel metal as a possible human carcinogen (Group 2B) and certain nickel compounds as known human carcinogens (Group 1).</p> <p>NTP reports that there is inadequate evidence for the carcinogenicity of chromium metal and most trivalent chromium (CrIII) compounds in humans and experimental animals. However, NTP classifies certain hexavalent chromium compounds as "known to be carcinogens." Similarly, IARC indicates that chromium metal and trivalent chromium compounds are not classifiable as human carcinogens (Group 3), but that certain hexavalent chromium compounds are known carcinogens (Group 1). Since the hexavalent form of chromium may be produced during welding, heat-treating and alkaline descaling processes, an industrial hygiene evaluation of such process should be conducted to determine if exposure to hexavalent chromium is present.</p>				
Section 3 Composition/Information on Ingredients				
Component		CAS Number	EC Number	% weight ¹
Iron [Iron oxide] Alloying Elements	(Fe)	7439-89-6	231-096-4	60 - 88
Chromium ³ (Metal)	(Cr)	7440-47-3	231-157-5	10 - 30
Nickel ³ (Metal)	(Ni)	7440-02-0	231-111-4	0 - 46
Manganese [elemental & inorganic cpds]	(Mn)	7439-96-5	231-105-1	0 - 15
Molybdenum	(Mo)	7439-98-7	231-107-2	< 8
Copper ³	(Cu)	7440-50-8	231-159-6	< 6
Titanium ³ [metal & dioxide]	(Ti)	13463-67-7	231-142-3	< 6
Carbon	(C)	7440-44-0	231-153-3	< 2
Aluminum ³	(Al)	7429-90-5	231-072-3	< 2

Section 3		Composition/Information on Ingredients (Continue)		
Phosphorus [yellow]	(P)	7723-14-0	231-768-7	< 0.2
Silicon	(Si)	7440-21-3	231-130-8	< 2
Niobium	(Nb)	7440-03-1	231-113-5	< 2
Tantalum [metal & oxide]	(Ta)	7440-25-7	231-135-5	< 2
Tin [metal]	(Sn)	7440-31-5	231-141-8	< 2
Cobalt ³ [elemental & inorganic cpds]	(Co)	7440-48-4	231-158-0	< 2
Lead ³ [elemental & inorganic cpds]	(Pb)	7439-92-1	231-100-4	< 0.1

CAS – Chemical Abstract Service

EC – European Community

¹Percent of alloying element varies with grade.

²Not classifiable as a human carcinogen

³SARA, Title III, Section 313 Toxic Chemical

⁴Ceiling limit not to be exceeded

⁵Animal carcinogen

*All commercial metals may contain small amounts of various elements in addition to those specified. These small quantities (less than 0.1%) frequently referred to as “trace” or “residual” elements, generally originate in the raw material used. These elements may include, but are not limited to the following: Arsenic, Cadmium, Nitrogen, and Zirconium.

Section 4

First Aid Measures

Description of necessary first aid measures:

- **Inhalation:** If large amounts of dust, fumes, and/or particulates are generated, move person to fresh air. If symptoms develop, seek medical attention.
 - **Eye contact:** If eyes contact with dust or particulates, flush eyes with running water for 15 minutes. Eye injuries from solid particles should be treated by a physician immediately.
 - **Skin contact:** If skin contact with dusts or powders, wash immediately with soap and water. Any cuts or abrasions should be treated promptly with thorough cleansing of the affected area.
 - **Ingestion:** If ingested no first aid needed, however if symptoms develop, seek immediate medical attention.
- For Ingestion of dusts or powder:** *If swallowed*, call a poison center or doctor/physician if you feel unwell. Rinse mouth thorough.

Important acute and chronic symptoms/effects:

Stainless steel products in their usual physical form do not present an inhalation, ingestion or contact hazard. However, operations such as burning, welding, sawing, brazing, machining and grinding may result in the following effects if exposures exceed recommended limits as listed in Section 8 – Exposure Controls/Personal Protection.

Acute Effects:

- **Inhalation:** Excessive exposure to high concentrations of dust may cause irritation to the eyes, skin and mucous membranes of the upper respiratory tract. Excessive inhalation of fumes of freshly formed metal oxide particles sized below 1.5 microns and usually between 0.02 - 0.05 microns from many metals can produce an acute reaction known as “metal fume fever”. Symptoms consist of chills and fever (very similar to and easily mistaken with flu symptoms), metallic taste in the mouth, dryness and irritation of the throat followed by weakness and muscle pain. The symptoms come on in a few hours after excessive exposures and usually last for 12 – 48 hours. Long-term effects from metal fume fever have not been noticed. Freshly formed oxide fumes of manganese have been associated with causing metal fume fever. Inhalation of chromium compounds may cause upper respiratory tract irritation. Inhalation of silica dusts may result in silicosis. Nickel compounds are respiratory tract irritants.
- **Eye:** Excessive exposure to high concentrations of dust may cause irritation and/or sensitization to the eyes. Particles of iron or iron compounds, which become imbedded in the eye, may cause rust stains unless removed promptly. Molybdenum compounds are eye irritants.
- **Skin:** Repeated or prolonged contact with dusts may cause skin irritation or sensitization, possibly leading to dermatitis and allergic sensitization. Molybdenum compounds are skin irritants.
- **Ingestion:** Ingestion of harmful amounts of this product as distributed is unlikely due to its solid insoluble form. Ingestion of dust may cause nausea or vomiting.

Chronic Effects by components:

- **Iron (Iron Oxide):** Chronic inhalation of excessive concentrations of iron oxide fumes or dusts may result in the development of a benign pneumoconiosis, called siderosis, which is observable as an X-ray change. No physical impairment of lung function has been associated with siderosis. Inhalation of excessive concentrations of ferric oxide may enhance the risk of lung cancer development in workers exposed to pulmonary carcinogens. Iron oxide is listed as a Group 3 (not classifiable carcinogen by IARC).

Chronic Effects by components (Continue):

- **Chromium:** The health hazards associated with exposure to chromium are dependent upon its oxidation state. The metal form (chromium as it exists in this product) is of very low toxicity. However, the hexavalent form is very toxic, repeated or prolonged exposure to hexavalent chromium compounds may cause respiratory irritation, nosebleed, ulceration and perforation of the nasal septum. Industrial exposure to certain forms of hexavalent chromium has been related to an increased incidence of cancer. The National Toxicology Program (NTP) Fourth Annual report on Carcinogens cites "certain Chromium compounds" as human carcinogens. American Conference of Industrial Hygienists (ACGIH) has reviewed the toxicity data and concluded that chromium metal is not classifiable as a human carcinogen. Hexavalent chromium may cause genetic defects and is suspected of damaging the unborn child. Developmental toxicity in the mouse, suspected of damaging fertility or the unborn child.
- **Nickel:** Exposure to nickel dusts and fumes can cause sensitization dermatitis, respiratory, irritation, asthma, pulmonary fibrosis, edema, and may cause nasal or lung cancer in humans. Causes damage to lungs through prolonged or repeated inhalation exposure. IARC lists nickel and certain nickel compounds as Group 2B carcinogens (sufficient animal data). ACGIH lists insoluble nickel compounds as confirmed human carcinogens. Suspected of damaging the unborn child.
- **Manganese:** Chronic exposure to high concentrations of manganese fumes and dusts may adversely affect the central nervous system with symptoms including languor, sleepiness, weakness, emotional disturbances, spastic gait, mask-like facial expression and paralysis. Animal studies indicate that manganese exposure may increase susceptibility to bacterial and viral infections. Occupational overexposure (Manganese) is a progressive, disabling neurological syndrome that typically begins with relatively mild symptoms and evolves to include altered gait, fine tremor, and sometimes-psychiatric disturbances. May cause damage to lungs with repeated or prolonged exposure.
- **Copper:** Inhalation of high concentrations of freshly formed oxide fumes and dusts of copper can cause metal fume fever. Chronic inhalation of copper dust has caused, in animals, hemolysis of the red blood cells, deposition of hemofuscin in the liver and pancreas, injury to lung cells gastrointestinal symptoms.
- **Molybdenum:** Certain handling operations, such as burning and welding, may generate both insoluble molybdenum compounds (metal and molybdenum dioxide) and soluble molybdenum compounds (molybdenum trioxide). Molybdenum compounds generally exhibit a low order of toxicity with the trioxide the more toxic. However, some reports indicate that the dust of the molybdenum metal, molybdenum dioxide and molybdenum trioxide may cause eye, skin, nose and throat irritation in animals. Also has been reported to cause induction of tumors in experimental animals, suspected of causing cancer. Molybdenum oxide is suspected of causing cancer in humans.
- **Silicon:** Silicon dusts are a low health risk by inhalation and should be treated as a nuisance dust. Eye contact with pure material can cause particulate irritation. Skin contact with silicon dusts may cause physical abrasion.
- **Aluminum:** Chronic inhalation of finely divided powder has been reported to cause pulmonary fibrosis and emphysema. Repeated skin contact has been associated with bleeding into the tissue, delayed hypersensitivity and granulomas. Chronic exposure to aluminum flake has been reported to cause pneumoconiosis in workers. Repeat oral exposure to aluminum results in decrements in neurobehavioral function and development.
- **Vanadium:** Is considered non-toxic. Excessive long term or repeated exposures to vanadium compounds, especially vanadium pentoxide, may result in chronic pulmonary changes such as emphysema or bronchitis. Vanadium pentoxide is suspected of damaging fertility or the unborn child. Vanadium pentoxide is fatal if swallowed or inhaled. It causes damage to lungs by single, repeated or prolonged exposure.
- **Boron:** Boron oxide dusts and fumes may cause upper respiratory tract and eye irritation, dryness of the mouth, nose or throat, and sore throat and productive cough.
- **Tungsten:** Tungsten has been shown to act by antagonizing the action of the essential trace element, Molybdenum. Tungsten metal powder administered to animals has been shown in several studies as not totally inert. One study found that guinea pigs treated orally or intravenously with tungsten suffered from anorexia, colic, incoordination of movement, trembling, dyspnea and weight loss. Long industrial experience has indicated no pneumoconiosis to develop among workers exposed solely to tungsten or its insoluble compounds (at air concentrations of the order of 5 mg/m³). In NIOSH's criteria document, two Russian studies were cited which indicated an incidence of 9 - 11% pulmonary fibrosis among employees exposed to tungsten without cobalt co-exposure.
- **Titanium:** There is no evidence of a health hazard from inhalation of titanium dioxide at airborne concentrations below 10 mg/m³. Rats (but not mice) exposed to ultrafine TiO₂ particles at 10 mg/m³ developed lung tumors; probably results from inhibited particle clearance from lung. The toxicity of titanium dioxide has been found to be relatively inert. Eye contact with pure material can cause particulate irritation. Skin contact with titanium dusts may cause physical abrasion Long-term inhalation exposure to high concentrations (over-exposure) to pneumoconiotic agents may act synergistically with inhalation of oxides, fumes or dusts of this product to cause toxic effects.

Carcinogenicity: IARC, NTP, and OSHA do not list steel products as carcinogens. IARC identifies nickel and certain nickel compounds and welding fumes as Group 2B carcinogens that are possibly carcinogenic to humans. ACGIH lists insoluble nickel compounds as confirmed human carcinogens. IARC lists chromium metal and trivalent chromium compounds as Group 3 carcinogens, not classifiable as to their human carcinogenicity. Hexavalent chromium compounds are listed by IARC as Group 1 carcinogens that are carcinogenic to humans. NTP Fourth Annual report on Carcinogens cites "certain Chromium compounds" as human carcinogens. ACGIH has reviewed the toxicity data and concluded that chromium metal is not classifiable as a human carcinogen. Medical Conditions Aggravated by Long-Term Exposure: Individuals with chronic respiratory disorders (i.e., asthma, chronic bronchitis, emphysema, etc.) may be adversely affected by any fume or airborne particulate matter exposure. SARA Potential Hazard Categories: Immediate Acute Health Hazard; Delayed Chronic Health Hazard

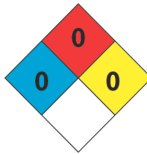
Suitable Extinguishing Media: Not applicable for solid product. Use extinguishers appropriate for surrounding materials. For fine, use a Type-D fire extinguisher or table salt to control small fires. Stainless steel will generate fine turnings, chips or dust. Warning: May Form Combustible (Explosive) Dust – Air Mixtures. Keep away from all ignition sources including heat, sparks, and flame. Keep container closed and grounded. Prevent dust accumulations to minimize explosion hazard.

Specific Hazards arising from the chemical: Not applicable for solid product.

Explosion Hazard: Accumulated metal dust can be combustible. Avoid creating dust.

Section 5 Fire and Explosion Hazard Information (Continue)

Special Protective Equipment and Precautions for Fire Fighters: Self-contained MSHA/NIOSH approved respiratory protection and full protective clothing should be worn when fumes and/or smoke from fire are present. Heat and flames cause emittance of acrid smoke and fumes. DO NOT RELEASE RUNOFF FROM FIRE CONTROL METHODS TO SEWERS OR WATERWAYS.

Hazardous Material Identification System (HMIS) Classification		National Fire Protection Associate (NFPA)
HEALTH	0	 <p>HEALTH = 0, No Hazard beyond that of ordinary combustible materials. FIRE = 0, Materials that will not burn INSTABILITY = 0, Normally stable, even under fire exposure conditions, and are not reactive with water.</p>
FLAMMABILITY	0	
PHYSICAL HAZARD	0	

Section 6 Accidental Release Measures

Personal Precautions, Protective Equipment and Emergency Procedures: Not applicable to nickel alloy in solid state. For spills involving finely divided particles, clean-up personnel should be protected against contact with eyes and skin. Collect material in appropriate, labeled containers for recovery or disposal in accordance with federal, state, and local regulations.

Environmental precautions: Not applicable to steel in solid state. Follow applicable federal, state, and local regulations.

Methods and materials for containment and clean up: Collect material in appropriate, labeled containers for recovery or disposal in accordance with federal, state, and local regulations. Follow applicable OSHA regulations (29 CFR 1910.120) and all other pertinent state and federal requirements.

Section 7 Handling and Storage

Precautions for safe handling: Operations with the potential for generating concentrations above ½ the PEL of airborne particulates should be evaluated and controlled as necessary. Practice good housekeeping. Avoid breathing metal fumes and/or dust. Conditions for safe storage, including any incompatibilities: Store away from acids and incompatible materials.






Section 8 Exposure Controls / Personal Protection

Component	CAS #	% weight ¹	OSHA PEL-TWA	ACGIH TLV-TWA
Iron [Iron oxide] Alloying Elements	(Fe) 7439-89-6	60 - 88	10.0 mg/m ³ [fume]	5.0 mg/m ³ ; A4 ² [dust & fume]
Chromium ³ (Metal)	(Cr) 7440-47-3	10 - 30	1.0 mg/m ³ [metal] 0.5 mg/m ³ [Cr (III)] 5.0 µg/m ³ [Cr (VI)] 2.5 µg/m ³ [Cr (VI)] Action Level	0.5 mg/m ³ ; A ⁴ [metal & Cr (III)] 0.05 mg/m ³ ; A1;BEI [Water-Soluble Cr (VI) compounds] 0.01 mg/m ³ ; A1 [Insoluble Cr (VI) compounds]
Nickel ³ (Metal)	(Ni) 7440-02-0	0 - 46	0.5 mg/m ³ [metal] 0.1 mg/m ³ [Insoluble compounds]	1.5 mg/m ³ ; A5 [elemental] 0.2 mg/m ³ ; A1 [Insoluble compounds] 0.1 mg/mg3; A1 [Nickel subsulfide]
Manganese [elemental & inorganic cpds]	(Mn) 7439-96-5	0 - 15	0.2 mg/m ³ [respirable fraction] 3 mg/m ³ STEL	0.02 mg/m ³ ; A4 [respirable fraction] 0.1 mg/m ³ ; A4 [Inhalable fraction]
Molybdenum	(Mo) 7439-98-7	< 8	10.0 mg/m ³ [total dust] 3.0 mg/m ³ [respirable]	10.0 mg/m ³ [inhalable] 3.0 mg/m ³ [respirable]
Copper ³	(Cu) 7440-50-8	< 6	0.1 mg/m ³ [fume] 1.0 mg/m ³ [dust & mist]	0.2 mg/m ³ [fume] 1.0 mg/m ³ [dust & mist]
Titanium ³ [metal & dioxide]	(Ti) 13463-67-7	< 6	15.0 mg/m ³ [total dust]	10 mg/m ³ ; A4 [dust]
Carbon	(C) 7440-44-0	< 2	N/A	N/A


Section 8 Exposure Controls / Personal Protection (Continue)					
Aluminum ³	(Al)	7429-90-5	< 2	10.0 mg/m ³ [total dust]	10.0 mg/m ³ [metal oxide]
Phosphorus [yellow]	(P)	7723-14-0	< 0.2	0.1 mg/m ³	0.1 mg/m ³
Sulfur [sulfur dioxide]	(S)	7746-09-5	< 0.2	5.0 mg/m ³	0.65 mg/m ³ ; A4;STEL
Silicon	(Si)	7440-21-3	< 2	15.0 mg/m ³ [total] 5.0 mg/m ³ [respirable fraction]	10.0 mg/m ³ [total] 5.0 mg/m ³ [respirable fraction]
Niobium	(Nb)	7440-03-1	< 2	N/A	N/A
Tantalum [metal & oxide]	(Ta)	74440-25-7	< 2	5.0 mg/m ³ [dust & oxide]	5.0 mg/m ³ [dust]
Tin [metal]	(Sn)	7440-31-5	< 2	2.0 mg/m ³	2.0 mg/m ³
Cobalt ³ [elemental & inorganic cpds]	(Co)	7440-48-4	< 2	0.02 mg/m ³ [dust & fume]	0.02 mg/m ³ ; A3 ⁵ [dust & fume]
Lead ³ [elemental & inorganic cpds]	(Pb)	7439-92-1	< 0.1	0.05 mg/m ³ [dust & fume]	0.02 mg/m ³ ; A3 ⁵ [dust & fume]

Section 9 Physical and Chemical Properties			
Appearance and Odor:	Silver-gray metallic solid form Odorless	Water Solubility:	Insoluble
Odor Threshold:	Not Applicable	Fat Solubility:	Not Applicable
Vapor Pressure:	Negligible	Other Solubilities:	Not Applicable
Vapor Density (Air = 1):	Not Applicable	Boiling Point:	NIF for alloy product (Ni-5252/Cr-3992/Fe-5432°F)
Formula Weight:	Not Applicable	Viscosity:	Not Applicable
Density:	Not Applicable	Refractive Index:	Not Applicable
Specific Gravity (H ₂ O) = 1, 60 °F)	7 – 9	Surface Tension:	Not Applicable
pH:	Not Applicable	% Volatile by volume:	Not Applicable
Flash Point (closed cup):	Not Applicable	Evaporation Rate:	Not Applicable

Section 10 Stability and Reactivity	
<p>Reactivity: Not Determined (ND) for product as a whole.</p> <p>Stability: Nickel Alloy products are stable under normal storage and handling conditions.</p> <p>Polymerization: Hazardous polymerization cannot occur.</p> <p>Chemical Incompatibilities: Will react with strong acids to form hydrogen. Iron oxide dusts in contact with calcium hypochlorite evolve oxygen and may cause an explosion.</p> <p>Conditions to Avoid: Storage with strong acids or calcium hypochlorite</p> <p>Hazardous Decomposition/Combustion Products: Thermal oxidative decomposition can produce fumes containing oxides of iron and manganese as well as other alloying elements.</p> <p>Sensitivity to Mechanical Impact: ND</p> <p>Sensitivity to Static Discharge: ND</p>	

Section 11 Toxicology Information				
<p>Toxicological information has not been established for this product as sold. However, processing of this product in operations such as high temperature (burning, welding), sawing, brazing, machining and grinding may produce fumes and/or particulates, which would result in the material being classified as hazardous under OSHA 29 CFR 1910.1200. The categories of Health Hazards as defined in "GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELLING OF CHEMICALS (GHS), Third revised edition ST/SG/AC.10/30/Rev. 3" United Nations, New York and Geneva, 2009 have been evaluated and are listed below:</p>				
Potential Hazard	Hazard Category	Hazard Symbol	Signal Word	Hazard Statement
Acute Toxicity Hazard	4 ^a		WARNING	Harmful if swallowed
Skin Irritation	3 ^b	No Symbol	WARNING	Causes skin irritation
Eye Damage / Irritation	2B ^c	No Symbol	WARNING	Causes eye irritation
Skin Sensitization	1 ^d		WARNING	May cause an allergic skin reaction
Carcinogenicity	2 ^g		WARNING	Suspected of causing cancer
Toxic Reproduction	2 ^h		WARNING	Suspected of damaging the unborn child
Specific Target Organ Systemic Toxicity (STOST) following Single Exposure	3 ⁱ		WARNING	May cause respiratory irritation

Section 11 Toxicology Information (Continue)

STOST following Repeating Exposure	1 ^j		WARNING	<p>Causes damage to lungs through prolonged or repeated inhalation exposure.</p> <p>Causes damage to the central nervous system</p>
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Notes:

a. **No LC₅₀ or LD₅₀** has been established for Stainless Steel (semi-finished steel products). The following data has been determined for the components:

- **Iron:** LD50= 1060 mg/kg (Oral/ Rat)
- **Manganese:** Mn single oral exposures, LD50 ranged from 275 to 804 mg/kg body weight per day for manganese chloride in different rat strains
- **Chromium (as Cr +VI):** LD50 = 80 mg/kg (Oral/Rat)
- **Silicon:** LD50 = 3160 mg/kg (Oral/Rat); and as Silicon Dioxide: LD50 > 15,000 mg/kg (Oral/Rat) ; LD50 > 5000 mg/kg (Dermal/Rat); LC50 > 0.69 mg/l/4hr (Inhalation/Rat)
- **Nickel:** LD50 > 9000 mg/kg (Oral/Rat); LC50 > 10.2 mg/l (Inhalation/Rat)
- **Boron:** LD = 650 mg/kg (Oral/Rat)

b. **No Skin (Dermal) Irritation** data available for Stainless Steel (semi-finished steel products) as a mixture. The following Skin (Dermal) Irritation information was found for the components:

- **Iron:** Causes skin irritation
- **Chromium (as Cr +VI):** Corrosive. Human skin sensitizer
- **Nickel:** Slight irritation only in rabbits
- **Molybdenum:** Irritating
- **Tungsten:** Skin contact may cause irritation due to abrasive action of the dust

c. **No Eye Irritation** data available for Stainless Steel (semi-finished steel products) as a mixture. The following Eye Irritation information was found for the components:

- **Iron, Molybdenum:** Causes eye irritation
- **Silicon:** Slight eye irritation in rabbit protocol
- **Chromium (as Cr +VI):** Corrosive
- **Nickel:** Slight eye irritation from particulate abrasion only.
- **Tungsten:** Eye contact may cause irritation due to abrasive action of the dust

d. **No Skin (Dermal) Sensitization** data available for Stainless Steel (semi-finished steel products) a mixture. The following Skin (Dermal) Sensitization information was found for the components:

- **Nickel:** Human skin sensitizer
- **Copper, Chromium (as Cr +VI):** May cause allergic skin reaction
- **Copper:** It is reported that copper may induce allergic contact dermatitis in susceptible individuals

e. **No Respiratory Sensitization** data available for Stainless Steel (semi-finished steel products) a mixture. The following Respiratory Sensitization information was found for the components:

- **Chromium (as Cr +VI):** Occupational asthma reported in workers

f. **No Germ Cell Mutagenicity** data available for Stainless Steel (semi-finished steel products) as a mixture. The following Mutagenicity and Genotoxicity information was found for the components:

- **Iron:** Some positive and negative findings in vitro
- **Chromium (as Cr +VI):** Positive in in vitro and in vivo assays including cell transformation in vitro and dominant lethal in vivo
- **Nickel:** Positive results in vitro and in vivo but insufficient data for classification
- **Aluminum:** Not mutagenic in vitro; but has marginal effects in vivo

g. **Carcinogenicity:** IARC, NTP, and OSHA do not list Stainless Steel (semi-finished steel products) as carcinogens. The following Carcinogenicity information was found for the components:

- **Welding Fumes,** IARC Group 2B carcinogen, a mixture that is possibly carcinogenic to humans.
- **Nickel and certain nickel compounds -** IARC Group 2B carcinogens that are possibly carcinogenic to humans. Insoluble nickel compounds - ACGIH confirmed human carcinogen. Nickel - EURAR Insufficient evidence to conclude carcinogenic potential in animals or humans; suspect carcinogen classification Category 2 Suspected of causing cancer. Nickel Oxide – HSDB listed as Category 1a, may cause cancer. Human data in which exposure to nickel refinery dust caused lung and nasal tumors.
- **Chromium metal and trivalent chromium compounds -** IARC Group 3 carcinogens, not classifiable as to their human carcinogenicity. Hexavalent chromium compounds - IARC as Group 1 carcinogens, carcinogenic to humans. Chromium metal – ACGIH not classifiable as a human carcinogen. NTP Fourth Annual report on Carcinogens cites “certain Chromium compounds” as human carcinogens.

h. **No Toxic Reproduction** data available for Stainless Steel (semi-finished steel products) as a mixture. The following Toxic Reproduction information was found for the components:

- **Hexavalent Chromium:** Developmental toxicity in the mouse.
- **Nickel:** Oral administration to experimental animals caused fetotoxicity.
- **Aluminum:** May cause delay in development of neurobehavioral indices.

i. **No Specific Target Organ Systemic Toxicity (STOST)** following a Single Exposure data available for Stainless Steel (semi-finished steel products) as a mixture. The following STOST following a Single Exposure data was found for the components:

- **Iron, Molybdenum:** May cause respiratory irritation.

Section 11 Toxicology Information (Continue)

j. No Specific Target Organ Systemic Toxicity (STOST) following Repeated Exposure data was available for Stainless Steel (semi-finished steel products) as a whole. The following STOST following Repeated Exposure data was found for the components:
• Aluminum: Chronic exposure to aluminum flake has been reported to cause pneumoconiosis in workers. Repeat oral exposure to aluminum results in decrements in neurobehavioral function and development.
• Manganese: Neurobehavioral alterations in worker populations with Mn and MnO including: speed and coordination of motor function are especially impaired
• Hexavalent Chrome: Inflammation of lung, skin irritation and ulceration with repeat exposures in workers.
• Nickel: Rats exposed to Nickel by inhalation at 1 mg/m3 for 90 days developed lung inflammation, hyperplasia and fibrosis.
• Boron: Mice exposed to amorphous boron at 72 mg/m3 for 6 weeks did not exhibit toxicity

The above toxicity information was determined from available scientific sources to illustrate the prevailing posture of the scientific community. The scientific resources includes: The American Conference of Governmental Industrial Hygienist (ACGIH) Documentation of the Threshold Limit Values (TLVs) and Biological Exposure indices (BEIs) with Other Worldwide Occupational Exposure Values 2009, The International Agency for Research on Cancer (IARC), The National Toxicology Program (NTP) updated documentation, the World Health Organization (WHO) and other available resources, the International Uniform Chemical Information Database (IUCLID), European Union Risk Assessment Report (EU-RAR), Concise International Chemical Assessment Documents (CICAD), European Union Scientific Committee for Occupational Exposure Limits (EU-SCOEL), Agency for Toxic Substances and Disease Registry (ATSDR), Hazardous Substance Data Bank (HSDB), and International Programme on Chemical Safety (IPCS).

Section 12 Ecological Information

Not applicable for alloy in its as-shipped form. No information has been found on specific alloy as a whole in order to determine its effect if released into the environment in finely divided form. It is believed that finely divided alloy, based on its components, will be hazardous to fish, animals, plants and the environment if released, the degree of which would depend on the particle size and quantity released. In addition, if particles are small enough, alloy may be ingested by wildlife, with possible toxic effects occurring.
The alloy is not expected to migrate easily into soil or groundwater based upon its insoluble form. However, finely-divided alloy can become mobile in water and contaminate soil and groundwater, if particles are small enough. Finely-divided alloy may persist in the environment for long periods, based upon the corrosion resistant, insoluble, and non-biodegradable properties of the alloy. In addition, heavy metals may contaminate the food chain and ultimately be consumed by humans.
Over time, steel will react with oxygen to form metallic oxides, the rate of which depends on various conditions. Iron oxidizes most rapidly in moist air. Metallic particulate discharged to a POTW may pass-through or contaminate sewage sludge, may interfere with the treatment system process, and may be non-compliant with a POTW permit or other regulations.

Hazard Category: Not Reported
Hazard Symbol: No Symbol
Signal Word: No Signal Word
Hazard Statement: No Hazard Statement
Ecotoxicity: No data available for the product, Stainless Steel as a whole However, individual components of the product have been found to be toxic to the environment. Metal dusts may migrate into soil and groundwater and be ingested by wildlife as follows:
• Hexavalent Chrome: EC50 and LD50 to algae and invertebrates < 1 mg.
• Aluminum: LC50> 100 mg/l for fish and algae
Mobility: No data available for the product, Stainless Steel (semi-finished steel products) as a whole. However, individual components of the product have been found to be absorbed by plants from soil.
Persistence & Degradability: No Data Available
Bioaccumulative Potential: No Data Available

Section 13 Disposal Considerations

Disposal: Steel scrap should be recycled whenever possible. Product dusts and fumes from processing operations should also be recycled, or classified by a competent environmental professional and disposed of in accordance with applicable federal, state or local regulations.
Dusts from use and processing may be classified as a hazardous waste, depending on various properties of the dust (e.g. toxicity, solubility, flammability), which are defined further within 40 CFR Part 261 and other federal, state and/or local laws. Solid waste generated from product use and processing should be classified by a competent environmental professional and disposed, processed or recycled in accordance with all applicable federal state and local laws.
Container Cleaning and Disposal: Follow applicable Federal, state and local regulations. Observe safe handling precautions. European Waste Catalogue (EWC): 16-01-17 (ferrous metals), 12-01-99 (wastes not otherwise specified), 16 03 (off specification batches and unused products), or 15 01 04 (metallic packaging).
Please note this information is for Stainless Steel in its original form. Any alterations can void this information.

Section 14 Transport Information

DOT Transportation Data (49 CFR 172.101):
US Department of Transportation (DOT) under 49 CFR 172 does not regulate Stainless Steel (semi-finished steel products) as a hazardous material. All federal, state, and local laws and regulations that apply to the transport of this type of material must be adhered to.

Section 14 **Transport Information (Continue)**

Shipping Name: NA Shipping Symbols: NA Hazard Class: NA UN No.: NA Packing Group: NA DOT / IMO Label: NA Special Provisions (172.102): NA	Packaging Authorizations a) Exceptions: NA b) Group: NA c) Authorization: NA	Quantity Limitations a) Passenger, Aircraft, or Railcar: NA b) Cargo Aircraft Only: NA Vessel Stowage Requirements a) Vessel Stowage: NA b) Other: NA DOT Reportable Quantities: NA
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The International Maritime Dangerous Goods (IMDG) and the Regulations Concerning the International Carriage of Dangerous Goods by Rail (RID) classification, packaging and shipping requirements follow the US DOT Hazardous Materials Regulation.

ADR - Regulations Concerning the International Carriage of Dangerous Goods by Road does not regulate Stainless Steel (semi-finished steel products) as a hazardous material.

Shipping Name: NA Classification Code: NA UN No.: NA Packing Group: NA ADR Label: NA Special Provisions: NA Limited Quantities: NA	Packaging a) Packing Instructions: NA b) Special Packing Provision: NA c) Mixed Packing Provisions: NA	Portable Tanks & Bulk Containers a) Instructions: NA b) Special Provision: NA
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IATA - International Air Transport Association (IATA) does not regulate Stainless Steel (semi-finished steel products) as a hazardous material.

Shipping Name: NA Class / Division: NA Hazard Label (s): NA UN No.: NA Packing Group: NA Excepted Quantities (EQ): NA	Passenger & Cargo Aircraft Limited Quantity (EQ) Package Instruction: NA Max Net Qty/Pkg: NA	Cargo Aircraft Only Package Instruction: NA Max Net Qty/Pkg: NA	Special Provisions: NA ERG Code: NA
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Pkg Inst - Packing Instructions	Max Net Qty/Pkg - Maximum Net Quantity per Package	ERG - Emergency Response Drill Code
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Transport Dangerous Goods (TDG) Classification: Stainless Steel (semi-finished steel products) does not have a TDG classification.

Section 15 **Regulatory Information**

Regulatory Information: The following listing of regulations relating to an ATI Allegheny Ludlum product may not be complete and should not be solely relied upon for all regulatory compliance responsibilities. This product and/or its constituents are subject to the following regulations:

OSHA Regulations: Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-2, Z-3): The product, Stainless Steel (semi-finished steel products) as a whole is not listed. However, individual components of the product are listed: Refer to Section 8, Exposure Controls and Personal Protection

EPA Regulations: Stainless Steel (semi-finished steel products) is not listed as a whole. However, individual components of the product are listed:

Components	Regulations
Aluminum (Al)	SWDA, SARA 313
Chromium (Cr)	CAA, CWA, SARA 313, SDWA, CERCLA, RCRA
Copper (Cu)	CWA, CERCLA, SDWA, SARA 313
Iron (Fe)	SDWA
Manganese (Mn)	SARA 313, CAA, CERCLA, SDWA
Molybdenum (Mo)	SDWA
Nickel (Ni)	CAA, CWA, SARA 313, CERCLA, RCRA, SDWA
Vanadium (V)	SARA 313

SARA Title III Hazard Categorization: Product (dust and fume) is categorized as an immediate (acute) health hazard and a delayed (chronic) health hazard as defined by 40 CFR 370.

SARA Title III Section 302 Extremely Hazardous Substances (EHSs): No components are listed as extremely hazardous substances.

Regulations Key:

CAA	Clean Air Act (42 USC Sec. 7412; 40 CFR Part 61 [As of: 8/18/06])
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act (42 USC secs. 9601(14), 9603(a); 40 CFR Sec. 302.4, Table 302.4, Table 302.4 and App. A)
CWA	Clean Water Act (33 USC Secs. 1311; 1314(b), (c), (e), (g); 136(b), (c); 137(b), (c) [as of 8/2/06])
RCRA	Resource Conservation Recovery Act (42 USC Sec. 6921; 40 CFR Part 261 App VIII)
SARA	Superfund Amendments and Reauthorization Title III Section 302 Extremely Hazardous Substances (42 USC secs. 11023, 13106; 40 CFR Sec. 372.65) and Section 313 Toxic Chemicals (42 USC secs. 11023, 13106; 40 CFR sec. 372.65 [as of 6/30/05])
TSCA	Toxic Substance Control Act (15 U.S.C. s/s 2601 et seq. [1976])
SDWA	Safe Drinking Water Act (42 U.S.C. s/s 300f et seq. [1974])

Section 313 Supplier Notification: This product, Stainless Steel (semi-finished steel products) contains the following toxic chemicals subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372:

CAS #	Chemical Name	Max Percent by Weight
7429-90-5	Aluminum	30
7440-47-3	Chromium	46
7440-50-8	Copper	4

Section 15 Regulatory Information (Continue)

CAS #	Chemical Name	Max Percent by Weight
7439-96-5	Manganese	10
7440-02-0	Nickel	1.1
7440-62-2	Vanadium	4

This information should be included in all MSDSs that are copied and distributed for this material.

State Regulations: The product, Stainless Steel (semi-finished steel products) as a whole is not listed in any state regulations. However, individual components of the product are listed in various state regulations:

Pennsylvania Right to Know: Contains regulated material in the following categories:

- Hazardous Substances: Chromium, Nickel, Manganese, Copper, Molybdenum, Tantalum, Tungsten, Aluminum, and Silicon
- Environmental Hazards: Aluminum (dust and Fume), Nickel, Tantalum Manganese, Copper, Vanadium and Chromium
- Special Hazard Substances: Chromium, Nickel and Iron

California Prop. 65: This product contains chromium and nickel metals/compounds known to the State of California to cause cancer. This product may contain trace amounts of other heavy metals, including arsenic, cadmium, cobalt and lead, known to the State of California to cause cancer, birth defects or other reproductive harm.

New Jersey: Contains regulated material in the following categories:

- Special Health Hazard Substances: Manganese, Nickel, and Chromium
- Hazardous Substance List: Iron Oxide (fume), Silicon, Titanium, Molybdenum, Vanadium, Tantalum, Tungsten, Aluminum (dust and fume), Chromium, Nickel, Manganese, Boron, and Copper
- Environmental Hazards: Tungsten, Nickel, Cobalt, and Chromium compounds

Minnesota: Iron Oxide (fume), Silicon, Nickel (elemental, soluble, and insoluble compounds), Aluminum (dust and fume), Chromium (metal),

Copper, Cobalt, and Manganese (elemental and compounds)

Massachusetts: Aluminum (dust and fume), Silicon (dust), Nickel, Copper, Cobalt, Chromium (compounds), Manganese, Vanadium Molybdenum, Tungsten, and Iron

Other Regulations:

WHMIS Classification (Canadian): Stainless Steel (semi-finished steel products) is not listed as a whole. However individual components are listed.

Ingredients	WHMIS Classification
Copper	D2B, B4
Iron	B4, D2B
Manganese	B4, D2A
Molybdenum	B4, D2B
Nickel	D2B
Silicon	B4
Titanium	D26
Vanadium	D3B

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

Section 16 Other Information

ABBREVIATIONS/ACRONYMS:

ACGIH American Conference of Governmental Industrial Hygienists	NIF No Information Found
BEIs Biological Exposure Indices	NIOSH National Institute for Occupational Safety and Health
CAS Chemical Abstracts Service	NTP National Toxicology Program
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act	ORC Organization Resources Counselors
CFR Code of Federal Regulations	OSHA Occupational Safety and Health Administration
CNS Central Nervous System	PEL Permissible Exposure Limit
GI, GIT Gastro-Intestinal, Gastro-Intestinal Tract	PNOR Particulate Not Otherwise Regulated
HMIS Hazardous Materials Identification System	PNOC Particulate Not Otherwise Classified
IARC International Agency for Research on Cancer	PPE Personal Protective Equipment
LC50 Median Lethal Concentration	ppm parts per million
LD50 Median Lethal Dose	RCRA Resource Conservation and Recovery Act
LD_{Lo} Lowest Dose to have killed animals or humans	RTECS Registry of Toxic Effects of Chemical Substances
LEL Lower Explosive Limit	SARA Superfund Amendment and Reauthorization Act
µg/m³ microgram per cubic meter of air	SCBA Self-contained Breathing Apparatus
mg/m³ milligram per cubic meter of air	SDS Safety Data Sheet
mppcf million particles per cubic foot	STEL Short-term Exposure Limit
MSDS Material Safety Data Sheet	TLV Threshold Limit Value
MSHA Mine Safety and Health Administration	TWA Time-weighted Average
NFPA National Fire Protection Association	UEL Upper Explosive Limit

Section 16**Other Information (Continue)**

While the information provided in this SDS is believed to provide a useful summary of the hazards of stainless steel as it is commonly used, the SDS cannot anticipate and provide all of the information that might be needed in every situation the user may experience. Each aspect of your operation should be examined to determine if, or where, additional precautions may be necessary. All health and safety information contained in this MSDS should be provided to your employees or customers. It is your responsibility to use this information to develop appropriate work practice guidelines and employee instructional programs for your operation. Professional industrial hygiene and/or safety engineering advice should be sought to assist you in this regard.

The information provided herein was believed by EnvironMolds, LLC, to be accurate at the time of preparation or prepared from sources believed to be reliable, but it is the responsibility of the user to investigate and understand other pertinent sources of information, to comply with all laws and procedures applicable to the safe handling and use of this product, and to determine the suitability of the product for its intended use.