an EnPro Industries company

Material Safety Data Sheet
Stainless Steel

SECTION 1:	Identification of the Substance/mixture and of the Company/Undertaking
GHS PRODUCT IDENTIFIER:	STAINLESS STEEL
OTHER MEANS OF IDENTIFICATION:	Coil, Plate, Angle, Bar, Rebar and Wire Coil.
RECOMMENDED USE OF THE CHEMICAL AND RESTRICTIONS OF USE:	Solid stainless steel products, varies forms and uses, manufacture of articles.

SECTION 2:	Hazards Identification
Classification:	Stainless steel is considered an article and not hazardous in its solid form. However, certain process such as cutting, milling, grinding, melting and welding could result in some hazardous materials being emitted. The following classification information is for the hazardous elements which may be emitted during these processes.

SIGNAL WORD, HAZARD STATEMENTS & SYMBOLS: DANGER SYMBOLS HAZARD GHS SYMBOLS HAZARD GHS

HARZARD	GHS CLASSIFICATION	HAZRAD STATEMENTS
		
Carcinogenicity	Category – 1B	May cause cancer
Respiratory Sensitizer	Category – 1	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
STOT (repeated exposure)	Category – 1	Causes damage to organs through prolonged or repeated exposure.
Toxic to Reproduction	Category – 1B	Suspected of damaging the unborn child
		
Acute Oral Toxicity	Category – 4	Harmful if swallowed
Skin Sensitizer	Category – 1	May cause allergic skin reaction
STOT (single exposure)	Category – 3	May cause respiratory irritation
N/A Eye Irritation	Category – 2B	Causes eye irritations.

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Precautionary Statements:

PREVENTION	FIRST AID RESPONSE
Do not breathe dust/fume/gas/vapor/spray. Use in well- ventilated area. Wash thoroughly after handling. Do not eat, drink or smoke when handling this product. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Contaminated work clothing should not be allowed out of the workplace.	Eyes: Flush eyes with plenty of water for at least 15 minutes. Seek medical attention if eye irritation persists Skin: Wash affected area with mild soap and water. Seek medical attention if skin irritation persists. Inhalation: Remove to fresh air. Check for clear airway, breathing and presence of pulse. If necessary administer CPR. Consult a physician immediately. Ingestion: Dust may irritate mouth and gastrointestinal tract, If ingested, seek medical attention promptly.
STORAGE	**DISPOSAL**
Store away from acids and incompatible materials Store in accordance with federal/provincial/state or local regulations	Steel scrap should be recycled whenever possible Otherwise, dispose of in accordance with applicable federal/provincial/state or local regulations

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): Not applicable

SECTION 3: Composition/Information on Ingredients

All values are expressed as weight percent and are approximate. The percent composition reflects the range that is possible within this group of products. These are not the technical specifications for particular product. All grades do not include all hazardous ingredients.

COMPONENT	CAS NUMBER	PERCENT
Iron	7439-89-6	45 - 90
Nickel	7440-02-2	0 - 40
Chromium	7440-47-3	10.5 – 30
Manganese	7439-96-5	0 - 15
Molybdenum	7429-98-7	0 - 5
Copper	7440-50-8	0 - 5
Silicon	7440-21-3	0 - 3
Aluminum	7429-90-5	0 - 1
Cobalt	7440-48-4	0 - 1
Titanium	7440-32-6	0 - 1
Vanadium	1314-62-1	Trace
Tungsten	7440-33-7	Trace
Tantalum	7440-25-7	Trace
Lead	7439-92-1	Trace

SECTION 4: **First Aid Measures**	
EYE CONTACT:	Wash with copious amounts of water for 15 minutes to ensure that no articles remain in the eye. Seek medical advice if irritation persists.
SKIN CONTACT:	If irritation develops, wash skin thoroughly with soap and water. Seek medical attention if necessary.
INHALATION:	Remove from dusty area to fresh air. If discomfort persists, consult physician.
INGESTION:	If significant amounts of dust are ingested consult a physician.
MOST IMPORTANT SYMPTOMS/EFFECTS, ACUTE AND DELAYED:	Stainless steel as a solid and shipped is not likely to present an acute or chronic health effects. However, during processing (cutting, milling, grinding, melting or welding) emitted byproducts may cause irritations, difficulty in breathing, coughing or wheezing. May cause allergic skin reactions.
INDICTAION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT, IF NECESSARY:	Notes to physician: May cause sensitization by skin contact or inhalation. Treat symptomatically

SECTION 5: **Firefighting Measure**	
SUITABLE EXTINGUISHING MEDIA:	Non-flammable. Will not support combustion. Not applicable for solid product. Use extinguishers appropriate for surrounding materials. Do not use water on molten metal. A fire involving finely divided alloy should be treated as Class D Combustible metal fire.
SPECIFIC HAZARDS ARISING FROM MATERIAL:	Not applicable for solid product.
HAZARDOUS COMBUSTION PRODUCTS:	Not applicable for solid formed alloy. Toxic metal and metallic oxide fumes may be evolved from fires involving finely divided alloy.
SPECIAL FIRE FIGHTING INSTRUCTIONS:	For solid formed alloy, as appropriate for surrounding fire. Firefighters should wear self-contained NIOSH-approved breathing apparatus and full protective clothing.
EXPLOSION DATA:	Solid formed alloy does not constitute a fire or explosion hazard. However, finely divided suspended particulates may present a fire and explosion hazard in the presence of an ignition source.

SECTION 6: **Accidental Release Measure**	
PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES:	Not applicable to stainless steel in solid state. Avoid dust formation. Ensure adequate ventilation. Clean –up personnel should be protected against inhalation and eye and skin contact.
ENVIRONMENTAL PRECAUTIONS:	Not applicable to stainless steel in solid state.
METHODS AND MATERIALS FOR CONTAINMENT AND CLEANING UP:	Not applicable to stainless steel in solid state. For spills involving fine dusts, remove by vacuuming or wet sweeping methods to prevent spreading of dust. Avoid inhalation of dusts.

SECTION 7: Handling and Storage

PRECAUTIONS OF SAFE HANDLING:	Not applicable to stainless steel in solid state. Operations with the potential for generating high concentrations of airborne particles should be evaluated and controlled as necessary. Practice good housekeeping. Avoid breathing metal fumes and/or dust.
CONDITIONS FOR SAFE STORAGE:	No special storage conditions for stainless steel in solid state
INCOMPATIBLE PRODUCTS:	Store away from acids and incompatible materials.

SECTION 8: Exposure Controls/Personal Protection

Control Parameters: There are no exposure limits for stainless steel. The exposure limit for iron-containing fumes has been established at 5 mg/m3 with ACGIH's TWA. The individual complex compounds with the fume may have lower exposure limits that then general fume.

COMPONENT	CAS NUMBER	OSHA PEL (mg/m3)	TLV ACGIH (mg/m3)
Iron	7439-89-6	10 mg/m3 Iron Oxide - Fume	5 mg/m3 Iron Oxide – Dust & Fume
Nickel	7440-02-2	1 mg/m^3, Metal, soluble & insoluble compounds	1.5 mg/ m^3 Metal 0.1 mg/ m^3 Soluble compounds 0.2 mg/ m^3, Insoluble compounds
Chromium	7440-47-3	1 mg/ m^3, Metal & insoluble salt 0.5 mg/m^3, Cr (III) 5 µg/m^3, Cr (VI) 2.5 µg/m^3 Action Level Cr (VI)	0.5 mg/m^3 Metal and Cr (III) 0.05 mg/m^3, Cr (VI) & water soluble compounds 0.01 mg/m^3, Cr (VI) Insoluble compounds
Manganese	7439-96-5	5 mg/m^3 (ceiling)	0.2 mg/m^3
Molybdenum	7429-98-7	5 mg/m^3 Soluble compounds as MO 15 mg/m^3 Total dust	5 mg/m^3 Soluble compounds as MO 10 mg/m^3 Insoluble compounds as MO
Copper	7440-50-8	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
Silicon	7440-21-3	15 mg/m^3 Total dust 5 mg/m^3 Respirable dust	10 mg/m^3 Total dust
Aluminum	7429-90-5	15 mg/m^3 Metal & Total dust 5 mg/m^3 Respirable dust	1 mg/m^3 Respirable dust 5 mg/m^3 Welding fume
Cobalt	7440-48-4	0.1 mg/m^3 Metal, Dust & Fume	0.02 mg/m^3 Metal, Dust & Fume
Vanadium	1314-62-1	0.5 mg/m^3 (ceiling) Vanadium Pentoxide dust 0.1 mg/m^3 (ceiling) Vanadium Pentoxide fume	0.05 mg/m^3 Vanadium Pentoxide
Tungsten	7440-33-7	15mg/m3 Total Dust 5mg/m3 Respirable Dust	1.0 mg/ m^3, 3 mg/m3 STEL Soluble 5.0 mg/ m^3, 10 mg/m3 STEL Insoluble
Tantalum	7440-25-7	5 mg/ m^3 Metal & Oxide Dust 10 mg/ m^3 STEL	5 mg/ m^3 Metal & Oxide Dust
Titanium	7440-32-6	15 mg/ m^3 Titanium Dioxide Total Dust	10 mg/ m^3 Titanium Dioxide Total Dust
Lead	7439-92-1	0.05 mg/ m^3	0.05 mg/ m^3

Note: OSHA PEL's and Threshold Limit Values (TLV) established by the Occupational Health and Safety Administration and the American Conference of Governmental Industrial Hygienists (ACGIH) are 8 hour Time Weighted Averages concentrations unless otherwise noted.

Appropriate Engineering Controls:	Local and or general exhaust ventilation should be used to keep worker exposure below applicable exposure limits during welding, brazing, grinding, machining, and other process which may generate airborne contaminants.
Individual Protective Measures:	Dependent upon process being performed on material each operation must be addressed for suitable equipment.
Gloves:	Suitable for protection against physical injury and skin contact during handling and processing.
Eyes:	Safety glasses or goggles should be worn when there is probability of flying particles or elevated levels of dust or fume.
Clothing:	N/A
Respirator:	If concentrations exceed established limits use NIOSH/MSHA approved particulate respirators (dust & fume or high efficiency dust and fume) when grinding or welding.
Footwear:	N/A
Other:	N/A

SECTION 9: Physical and Chemical Properties

Physical State	Solid	Appearance	Solid Silver-grey metallic
Odor	Odorless	Odor Threshold	Not Applicable
pH	Not Applicable	Melting Point	2500 – 2800 °F
Boiling Point	Not Applicable	Flash Point	Not Applicable
Evaporation Rate	Not Applicable	Flammability (solid, gas)	Not flammable
Upper Flammable Limit%	Not Applicable	Lower Flammable Limit	Not Applicable
Vapor Pressure	Not Applicable	Vapor Density	Not Applicable
Relative Density	Not Applicable	Specific gravity	7.65 – 7.94
Solubility	Not Applicable	Partition Coefficient	No data
Auto-ignition Temp ©	Not Applicable	Decomposition Temperature	No data
Viscosity	Not Applicable		
Other Information	Not Applicable		

SECTION 10: Stability and Reactivity

REACTIVITY:	Not determined for product in solid form.
CHEMICAL STABILITY:	Stable under normal conditions of transport, storage and use for solid formed product.
POSSIBILITY OF HAZARDOUS REACTIONS:	Hazardous polymerization will not occur.
CONDITIONS TO AVOID:	Contact with mineral acids will release flammable hydrogen gas. Dust formation.
INCOMPATIBLE MATERIALS:	Oxidizers, Reacts with strong acids to form explosive hydrogen gas.
HAZARDOUS DECOMPOSITION PRODUCTS:	During certain operations such as welding, burning, melting or hot rolling, metal fumes may be generated. Hexavalent chromium which is a suspect carcinogen may result from pickling stainless.

SECTION 11: Toxicological Information

TOXICITY

COMPONENT	LD_{50} ORAL	LD_{50} DERMAL	LD_{50} INHALATION	OTHER
Iron	30,000 mg/kg Oral -Rat	-	-	-
Nickel	>9,000 mg/kg Oral -Rat	-	-	-
Chromium	No data available	-	-	-
Manganese	9,000 mg/kg Oral -Rat	-	-	-
Molybdenum	No data available	-	-	-
Copper	No data available	-	-	-
Silicon	3,160 mg/kg	-	-	-
Aluminum	No data available	-	-	-
Cobalt	6,171 mg/kg Oral -Rat	-	-	-

LIKELY ROUTES OF ENTRY: None for stainless steel in its natural state.

EYES: High concentration of dust may cause irritation to the eyes

SKIN: Prolonged skin contact with dust may cause skin irritation to sensitive individuals

INHALATION: Inhalation of metal particulate or elemental oxide fumes generated during welding, burning or grinding machining may pose acute or chronic health effects.

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS: None for stainless steel in its natural solid shape

EFFECTS OF ACUTE EXPOSURE TO MATERIAL

MANGANESE & COPPER: Inhalation overexposure to manganese or copper (or zinc coated products) may cause metal fume fever characterized by fever and chills (flue like symptoms) which appear 4-6 hours after exposure with no long term effects.

EFFECTS OF CHRONIC EXPOSURE TO MATERIAL:

CHROMIUM: IARC lists certain hexavalent chromium compounds under its Group 1 category "confirmed carcinogenicity to humans." And metallic chromium under its group 3 category – "not classifiable as to their carcinogenicity to humans." Chromium metal is classified as a carcinogenic by NTP. Dermatitis may result from exposure to chromium fumes.

Nickel: IARC lists metallic nickel under its Group 2B category – "possibly carcinogenic to humans." Nickel may cause skin sensitivity.

COBALT: Cobalt dust may result in an asthma-like condition (cough, shortness of breath). IARC lists metallic cobalt under its Group 2B category – "possibly carcinogenic to humans."

COPPER: Copper fumes my result in Wilson's Disease (characterized by hepatic cirrhosis, brain damage, demyelination, renal disease, and copper deposition in the cornea.

IRON: Inhalation overexposures may cause a benign pneumoconiosis (siderosis) with few or no symptoms.

MANGANESE: Existing studies are inadequate to assess its carcinogenicity. Susceptible to Parkinson's disease, metal fume fever and kidney damage.

STOT (Single Exposure): No data

STOT (Repeated Exposure): Respiratory system. Allergic skin reactions.

Mutagenicity of Material: N/A

Reproductive Effects: N/A

Teratogenicity of Material: N/A

Carcinogenicity of Material

CHROMIUM:	IARC lists certain hexavalent chromium compounds under its Group 1 category "confirmed carcinogenicity to humans." And metallic chromium under it's group 3 category – "not classifiable as to their carcinogenicity to humans." Chromium metal is classified as a carcinogenic by NTP.
Nickel:	IARC lists metallic nickel under its Group 2B category – "possibly carcinogenic to humans.
COBALT:	IARC lists metallic cobalt under it's Group 2B category – "possibly carcinogenic to humans."
Synergistic Materials:	N/A
Aspiration Hazard:	No Data
Sensitization of Material:	N/A

LD50 (of Material) Not established LC50 of Material) Not established

Notes:

STOT – Specific Target Organ Toxicity

International Agency for Research on Cancer (IARC) Summaries & Evaluation (2008)

3rd Annual Report on Carcinogens as prepared by the National Toxicology Program (NTP)Iron containing welding fume has an exposure limit of 5 mg/m3 (ACGIH-TLV'S 2011), welding fume may also contain contaminants from flues or welding consumables. Prolonged skin contact may cause reddening and drying of skin or dermatitis in sensitive individuals due to nickel and/or chromium content in steel.

SECTION 12: Ecological Information

ECOTOXICITY: No data available in the stainless steel in its natural solid state. However, individual components of the material has been found to be toxic to the environment.

COMPONENT	TOXICITY TO FISH	TOXICITY TO ALGAE	TOXICITY TO MICROORGANISMS
Iron	LC_{50} Common Carp 96 hr. 0.56 mg/l	-	-
Chromium	LC_{50} Fathead minnow 96 hr. 10-100 mg/l	-	-
Nickel	LC_{50} Common Carp 96 hr. 1.3 mg/l	EC_{50} Freshwater Algae 72 hr. 0.18 mg/l	EC50 Water Flea 48 hr. 1.0 mg/l

PERSISTENCE AND DEGRADABILITY:	No data available
BIOACCUMULATIVE POTENTIAL:	No data available
MOBILITY IN SOIL:	No data available for stainless steel in its natural solid state. Individual metal dusts may mitigate into soil and groundwater and be absorbed by plants.
OTHER ADVERSE EFFECTS:	None known.

SECTION 13: Disposal Considerations

Waste Disposal Methods:	Steel scrap should be recycled whenever possible.
Container Cleaning and Disposal:	Dispose of in accordance with applicable federal, provincial/state or local regulations.

SECTION 14: Transport Information

GENERAL SHIPPING INFORMATION:	Stainless steel is not regulated for shipping.
SHIPPING NAME AND DESCRIPTION:	N/A
UN NUMBER:	N/A
HAZARD CLASS:	N/A
PACKING GROUP/RISK GROUP:	N/A

NOTE:	Stainless steel transported in coiled from is under tension and represents a significant source of potential energy due to the tension induced by coiling; it will uncoil to try to lay flat in a long strip when banding is cut or other forces are released. Uncoiling can be sudden and catastrophic and measures should be taken to ensure that uncoiling will not occur.
TRANSPORT REGULATIONS:	Canadian Transportation of Dangerous Goods Regulations (TDG) March 2011 US Department of Transportation (DOT) Hazardous Materials shipping information (Title 49 – Transportation March 2011)

SECTION 15: Regulatory Information

REGULATORY INFORMATION:	The following listing of regulation relating to North American Stainless product may not be complete and should not be solely relied upon for all regulatory compliance responsibilities.
ADDITIONAL CANADIAN REGULATIONS:	
WHIMS CLASSIFICATION: Class D2A/D28:	Materials causing other toxic effects.
DOMESTIC SUBSTANCES LIST:	The components of this material are on the federal DSL inventory
OTHER CANADIAN REGULATIONS:	N/A
ADDITIONAL US REGUALTIONS:	The components of this material are subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act

(SARA = Oct 2006) as follows:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)	CERCLA Reportable quantities
Aluminum	No	No	Yes	None listed
Chromium	No	No	Yes	5,000 lb.
Cobalt	No	No	Yes	None listed
Copper	No	No	Yes	5,000 lb.
Manganese	No	No	Yes	None listed
Nickel	No	No	Yes	100 lb.

SARA THRESHOLD PLANNING QUANTITY:	There are no specific Threshold Planning Quantities for the components of the material. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lbs. (4.540 kg) therefore applies, per 40 CFR 370.20.
TSCA INVENTORY STATUS:	The components for this material are listed on the Toxic Substances Control Act Inventory.
CERCLA REPROTABLE QUANTITY (RQ):	RQ'S for Hazardous Substances in the Comprehensive Environmental Response, Compensation, and Liability Act are : Chromium = 5,000 lbs. (2270 kg); Cooper = 5,000 lbs. (2270 kg); Nickel = 500 lb. (45 kg).
CALIFORNIA (PROPOSITION 65):	The Chromium (VI) component of this material is known in the State of California to cause cancer. The Nickel component of this material is known in the State of California to cause cancer. The Cobalt component of this material is known in the State of California to cause cancer.

OTHER FEDERAL REGULATIONS:	Arsenic (inorganic), Cadmium and Lead are possible trace elements known in the State of California to cause cancer. PENNSYLVANIA R-T-K LIST: Aluminum, Manganese, Molybdenum, Nickel, Silicon, Chromium, Cobalt, Copper and Tantalum. NEW JERSEY R-T-K LIST: Aluminum, Chromium, Copper, Cobalt, Manganese and Nickel.

SECTION 16: Other Information

STAINLESS STEEL
HAZARD LABEL RATING SYSTEMS:
NATIONAL FIRE PROTECTION CODE:
NFPA H=0 F=0 R=0

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM:
HMIS CODE: H=1* F=0 R=0 PPE: SEE SECTION 8
*Denotes possible chronic hazard if airborne dusts or fumes are generated.

HEALTH	1*
FLAMMABILITY	0
REACTIVITY	0
OTHER	

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