090-068 , 090-069, 090-070, 090-071, 140-014, 140-025, 140-026

RICOMED MANUFACTURING

737 Ocean View
Pt Roberts, WA 98281

T 360-945-1599
F 2534840812
twolter@ricomed.com

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MATERIAL SAFETY DATA SHEET

Stainles Steel 301, 303, 304 316

Section I - Ingredients

Material/Component	CAS Number	% Weight	Exposure Limits OSHA PEL (mg/m^3)	Exposure Limits ACGIH TLV (mg/m^3)
Base Metal				
Iron (Fe)	7439-89-6	39-81	10 (Fe_2O_3 Fume)	5 (Fe_2O_3 Fume)
Alloying Elements				
Carbon (C)	7440-44-0	0.5 max	None Listed	None Listed
Manganese (Mn)	7439-96-5	10.0 max	5.0 as Mn	1.0 as Mn
Phosphorous (P)	7723-14-0	0.001-0.2	0.1 as P	0.1 as P
Sulfur (S)	7704-34-9	0.001-0.35	13 (Sulfur Dioxide)	5 (Sulfur Dioxide)
Silicon (Si)	7440-21-3	2.0 max	None Listed	None Listed
Chromium (Cr)	7440-47-3	10-27	1.0 as Cr	0.5 as Cr
Nickel (Ni)	7440-02-0	0-22	1.0 as Ni	1.0 as Ni
Selenium (Se)	7782-49-2	0-0.35	0.2 as Se	0.2 as Se
Columbium (Cb)	7440-03-1			
Tantalum (Ta)	7440-25-7	10 x C % W_1	5.0 as Ta	5.0 as Ta
Copper (Cu)	7440-50-8	0.04-4	0.2 as Cu	0.2 as Cu
Molybdenum (Mo)	7439-98-7	0-4	5.0 Soluble Compds	5.0 Soluble Compds
Aluminum (Al)	7429-90-5	0-2	None Listed	5.0 as Welded Fumes
Titanium (Ti)	7440-32-6	0.70 max	15 (Ti O_2)	10 as Total Dust

NOTE: The above listing is a summary of elements used to alloy stainless steel. Various grades of steel will contain different combinations of these elements. Trace elements may also be present in minute amounts.

Section II - Physical Data

Material (at normal conditions): Solid
Appearance and Odor: Gray-Black with Metallic Lustre – Odorless
Acidity / Alkalinity: ph = NA
Melting Point: 2700°F
Boiling Point: NA
Specific Gravity (H_2O=1): Approx 8

Solubility in water (% by weight): NA
Vapor Pressure: NA

Section III - Personal Protective Equipment

Respiratory Protection
NIOSH approved dust/mist/fume respirator should be used during welding or burning if OSHA PEL or TLV is exceeded.

Hands, Arms and Body
Use appropriate clothing such as welders aprons & gloves when welding or burning. Check local codes.

Eyes and Face
Safety glasses should always be worn when grinding or cutting; face shields should be worn when welding or burning.

Other Clothing and Equipment
As required for protection depending on the operation and safety codes.

Section IV - Emergency Medical Procedures

Inhalation
Remove to fresh air; if condition continues, consult physician.

Eye Contact
Immediately flush well with running water to remove particulate; get medical attention.

Skin Contact
If irritation develops, remove clothing and wash well with soap and water. If condition persists, seek medical attention.

Ingestion
If significant amounts of metal are ingested, seek medical attention.

Section V - Health/Safety Information

HEALTH
Steel products in the natural state do not present an inhalation, ingestion, or contact health hazard. However, operations such as welding, burning, sawing, brazing, grinding, and possibly machining, which results in elevating the temperature of the product to or above its melting point or results in the generation of airborne particulates may present hazards. The above operations should be performed in well ventilated areas. The major exposure hazard is inhalation.

Effects of overexposure are as follows:

Acute: Excessive inhalation of all metallic fumes and dusts may result in irritation of eyes, nose and throat. Also high concentrations of fumes and ducts of

iron-oxide, manganese, copper & selenium may result in metal fume fever. Typical symptoms consist of a metallic taste in the mouth, dryness and irritation of the throat, chills and fever, and usually last from 12 to 48 hours.

Chronic: Chronic and prolonged inhalation of high concentrations of fumes or dust of the following elements may lead to the conditions listed opposite the elements:

Iron (iron-oxide): Pulmonary effects, siderosis
Manganese: Bronchitis, pneumonitis, lack of coordination, central nervous system.
Chromium: Various forms of dermatitis, inflammation and/or ulceration of upper respiratory tract, and possibly cancer of nasal passages and lungs. Based on available information, there does not appear to be any evidence that exposure to welding fume induces human cancer.
Nickel: SAME AS CHROMIUM
Selenium: Nasal and bronchial irritation, gastro-intestinal disturbances, garlic odor of breath.
Copper: Pulmonary effects, nasal and paranasal sinus, skin and liver.
Vanadium: May affect lungs. May affect blood pressure as vanadium pentoxide.
Cobalt: Inhalation of cobalt dust may cause an asthma-like disease with cough and dyspnea.
Molybdenum: Pain in joints, hands, knees and feet.

Medical conditions generally aggravated by exposure would be dermatitis and pulmonary disease or disorders.

Occupational Exposure Limits: See Ingredients (Section I)
Chromium and Nickel have been identified by the International Agency for Research on Cancer (IARC) and the National Toxicology Program (NTP) as potential carcinogens.

FIRE AND EXPLOSION

Flash Point: NA
Auto Ignition Temperature: NA
Extinguishing Method: NA
Extinguishing Method Not to be used: NA
Fire and Explosion Hazards: Steel products in their natural state do not present a fire or explosion hazard.

Flammable Units in Air:
Lower: NA
Upper: NA

REACTIVITY

Stability: Stable
Incompatibility (Materials to Avoid): Stable under normal conditions to use, storage and transport. Reacts with strong acids to form hydrogen gas. At temperatures above melting point, metallic oxide fumes may be liberated.
Conditions to Avoid: Non-ventilated areas when cutting, welding, burning or brazing; avoid generation of airborne dust and fumes.
Keep Area Well Ventilated

***Hazardous Decomposition Products*:** Metallic oxides

Section VI - Environmental

Spill or Leak procedures

Special Precautions: NA - Use good housekeeping practices to prevent accumulation of dust and to keep airborne dust to a minimum, Avoid breathing metal fumes or dust.

Waste Disposal Method: Dust, etc. – follow federal, state, and local regulations regarding disposal.

Section VII - Additional Information

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