

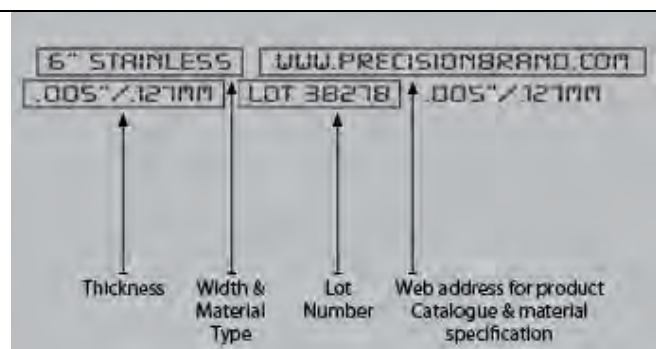
Precision Brand Stainless Steel 316 Shim Stock

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Precision Brand Stainless Steel 316 shim is made from a soft (annealed) temper material.
Type 316 Stainless Steel has better corrosion resistance to most chemicals, salts and acids and most marine atmospheres because of an addition of 2.0 to 3.0% molybdenum.

Stainless Steel 316 is used extensively in chemical and food processing equipment, photographic, pharmaceutical, marine and textile finishing equipment.



Continuous Marking along length of Shim Roll:

Manufacturers Website
Shim Width
Shim Material
Shim Thickness
Traceable Lot Number

Accuracy Specifications:

Material and Mechanical Properties:

Inch

Thickness inch	Tolerance 6" Width	Tolerance 12" Width
0.001 – 0.010	± 10%	± 10%
0.011 – 0.019	± 0.001	± 0.0015
0.020 – 0.028	± 0.0015	± 0.0015
0.029 – 0.031	± 0.002	± 0.002

Metric

Thickness mm	Tolerance mm
0.05	± 0.006
0.10	± 0.012
0.15	± 0.018
0.20	± 0.024
0.25 & 0.30	± 0.030
0.40	± 0.045
0.50	± 0.047
0.65	± 0.054

Material	Stainless Steel: Type 316
Carbon	0.08 Max
Manganese	2.00 Max
Phosphorous	0.045 Max
Sulphur	0.03 Max
Nickel	10.00 – 14.00
Chromium	16.00 – 18.00
Nitrogen	0.10 Max
Silicon	0.75 Max
Molybdenum	2.00 – 3.00
Iron	Balance
Temper	Annealed
Hardness	95 Max B Scale
Tensile Strength	70,000 PSI Min.
Yield Strength	25,000 PSI Min.
Elongation	40% in 2" Min
Meets Specifications	ASTM-A-240 ASTM-A-666 (Rockwell hardness not required)

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Metric Shim Rolls: 150mm wide x 1.25m long

Code	Thickness mm	Thickness inch	Box Qty	Included in Assortment Pack	Width mm	Length	Weight kilos	Weight lbs
77-422-605	0.05mm		1	Yes	150mm	1.25m	0.11	0.25
77-422-610	0.10mm		1	Yes	150mm	1.25m	0.20	0.43
77-422-625	0.25mm		1	Yes	150mm	1.25m	0.44	0.98
77-422-630	0.30mm		1	Yes	150mm	1.25m	0.56	1.24
77-422-635	0.40mm		1	Yes	150mm	1.25m	0.69	1.53
77-422-640	0.50mm		1	Yes	150mm	1.25m	1.00	2.20
77-422-645	0.65mm		1	Yes	150mm	1.25m	1.24	2.74
77-422-650	0.80mm		1	Yes	150mm	1.25m	1.44	3.18

Packed Weight and Dimensions

Code	Thickness mm	W mm	H mm	L mm	Weight kilos	Weight lbs
77-422-605	0.05mm	80	80	180	0.11	0.25
77-422-610	0.10mm	80	80	180	0.20	0.43
77-422-625	0.25mm	80	80	180	0.44	0.98
77-422-630	0.30mm	120	120	180	0.56	1.24
77-422-635	0.40mm	120	120	180	0.69	1.53
77-422-640	0.50mm	210	165	210	1.00	2.20
77-422-645	0.65mm	210	165	210	1.24	2.74
77-422-650	0.80mm	210	165	210	1.44	3.18

Metric Shim Assortment Pack: 150mm wide x 300mm long

Code	Description	Range	No. Of Sheets	Weight kilos
	Stainless Steel Assortment Pack Metric	0.05mm – 0.80	8	5.70

Packed Weight and Dimensions

Code	W mm	H mm	L mm	Weight kilos
	165	25	320	5.70

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Inch Shim Rolls: 6" wide x 50" long

Code	Thickness inch	Thickness mm	Box Qty	Included in Assortment Pack	Width in	Length in	Weight kilos	Weight lbs
77-422-801	0.001"	0.025	1	Yes	6"	50"	0.10	0.21
77-422-802	0.002"	0.051	1	Yes	6"	50"	0.11	0.25
77-422-803	0.003"	0.076	1	Yes	6"	50"	0.15	0.34
77-422-804	0.004"	0.102	1	Yes	6"	50"	0.20	0.43
77-422-805	0.005"	0.127	1	Yes	6"	50"	0.25	0.56
77-422-806	0.007"	0.178	1	Yes	6"	50"	0.33	0.73
77-422-807	0.010"	0.254	1	Yes	6"	50"	0.44	0.98
77-422-808	0.012"	0.305	1	Yes	6"	50"	0.56	1.24
77-422-809	0.015"	0.381	1	Yes	6"	50"	0.69	1.53
77-422-810	0.020"	0.508	1	Yes	6"	50"	1.00	2.20
77-422-811	0.025"	0.635	1	Yes	6"	50"	1.24	2.74
77-422-812	0.031"	0.787	1	Yes	6"	50"	1.44	3.18

Packed Weight and Dimensions

Code	Thickness inch	Thickness mm	W mm	H mm	L mm	Weight kilos	Weight lbs
77-422-801	0.001"	0.025	80	80	180	0.10	0.21
77-422-802	0.002"	0.051	80	80	180	0.11	0.25
77-422-803	0.003"	0.076	80	80	180	0.15	0.34
77-422-804	0.004"	0.102	80	80	180	0.20	0.43
77-422-805	0.005"	0.127	80	80	180	0.25	0.56
77-422-806	0.007"	0.178	80	80	180	0.33	0.73
77-422-807	0.010"	0.254	80	80	180	0.44	0.98
77-422-808	0.012"	0.305	120	120	180	0.56	1.24
77-422-809	0.015"	0.381	120	120	180	0.69	1.53
77-422-810	0.020"	0.508	210	165	210	1.00	2.20
77-422-811	0.025"	0.635	210	165	210	1.24	2.74
77-422-812	0.031"	0.787	210	165	210	1.44	3.18

Inch Shim Assortment Pack: 6" wide x 12" long

Code	Description	No. of Sheets	Range	Weight Kilos
77-422-895	Stainless Steel 316 Assortment Pack Inch	12	0.001" – 0.031"	6.60

Packed Weight and Dimensions

Code	W mm	H mm	L mm	Weight kilos
77-422-895	165	25	320	6.60

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Traceable Material Report

To obtain a Material Report covering the Shim you have purchased, please supply the following information marked on the shim and box to Precision Brand by email to mpotyrala@pbrand.com with the following information.

Example shown is for 302 Stainless Steel

Material	Thickness	Width	Lot Number Marked on the shim	UPC Number
Stainless Steel	0.006"	6"	3493601	22240



ISO 9001:2000 Certified Company

PRECISION BRAND PRODUCTS, INC.
2250 CURTISS STREET
DOWNERS GROVE, IL 60515 USA
PHONE: (630) 969-7200 FAX: (630) 969-7275

16 July, 2008

.006" x 6" 302 Full Hard Stainless Steel

Chemical Analysis

Carbon (C)	.0420	Chromium (Cr)	18.1000	Boron (B)	
Manganese (Mn)	1.260	Titanium (Ti)		Vanadium (V)	
Phosphorus (P)	.0260	Molybdenum (Mo)	.1400	Nitrogen (N)	
Sulfur (S)	.0010	Aluminum (Al)		Niobium (Nb)	
Silicon (Si)	.3600	Copper (Cu)	.2000		
Nickel (Ni)	8.0500	Tin (Sn)			

Physical Properties

Hardness	15N81
Tensile p.s.i.	186000
Yield p.s.i.	174000
% Elongation in 2"	3.9000
Specification(s)	ASTM-A666
Heat No.	681452
Coil No.	6859701
Branded™ Shim No.	34936-xx

We hereby certify that the above information conforms to the mill certificates provided by our suppliers for the material imprinted with the "Branded™ Shim" number listed above.

Sincerely Yours,
Precision Brand Products, Inc.

Digitally signed by K. Hahn
DN: cn=K. Hahn, o=US,
c=Precision Brand Products,
ou=Precision Brand,
email=k.hahn@precisionbrand.com
Date: 2008.07.16 10:43:08 -0500

Representative
K. Hahn

www.precisionbrand.com

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Identity (Trade name used on label)	Product Code (First two digits of UPC No.)
Tool Wrap	20
Stainless Steel Shim & Slotted Shim	22, 42
Laminated Stainless Steel Shim	72
Stainless Steel Thickness Gage	77
Stainless Steel Arbor Spacers/Shim	82,83

SECTION 1 – CHEMICAL PRODUCT & COMPANY IDENTIFICATION

Product: Stainless Steel 301,302,321	Description: Solid product, various forms and uses
Manufacturer: Precision Brand Products Inc. 2250 Curtiss Street Downers Grove IL 60515 USA	Phone Number (For Information) 630-969-7200
	Emergency Phone Number Chemtrec 800-424-9300 USA & Canada 202-483-7616 International
Date Approved: 12-15-07	Review date: 07-22-10

SECTION 2 – COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT & CAS No.	% by wght	OSHA PEL (mg/m ³)	ACGIH TLV (mg/m ³)
Iron (Fe) CAS No. 7439-89-6	Balance	10, Iron Oxide form, fume	5, Iron Oxide form, dust and fume
Nickel (Ni) CAS No. 7440-02-0	0-46	1, metal & insoluble compounds	1.5 metal 0.1, soluble compounds 0.2 insoluble compounds
Chromium (Cr) CAS No. 7440-47-3	10-30	1, metal & insoluble salts 0.5, Cr (⁺³) compounds AL-2.5 µg/m ³ / PEL 5.0 µg/m ³ (as Cr ⁺⁶)	0.5, metal & Cr (⁺³) compounds 0.05, Cr (⁺⁶) water soluble compounds 0.01, Cr (⁺⁶) insoluble compounds
Molybdenum (Mo) CAS No. 7439-98-7	0-7.0	5, soluble Mo compounds (as Mo) 15, insoluble Mo compounds, total dust (as Mo)	5, soluble Mo compounds (as Mo) 10, insoluble Mo compounds (as Mo)
Copper (Cu) CAS No. 7440-50-8	0-4.0	0.1, fume (as Cu); 1 dust and mist (as Cu)	0.2, fume (as Cu); 1, dusts and mists (as Cu)
Manganese (Mn) CAS No. 7439-96-5	0-10	5 Ceiling, Mn compounds and Mn fume (as Mn)	0.2, elemental and inorganic compounds (as Mn)
Silicon (Si) CAS No. 7440-21-3	0-6.5	15, total dust 5, respirable fraction	10, total dust
Columbium (Cb) CAS No. 7440-03-1	0-1.0	15, total dust (PNOR) 5, respirable fraction (PNOR) (not regulated)	10, total dust (PNOC) (not classified)
Aluminum (Al) CAS No. 7429-90-5	0-4.0	15, metal, total dust (as Al) 5, metal, respirable fraction (as Al)	10, metal dust 5, welding fume
Vanadium (V) CAS No. 7440-62-2	0-1.1	0.5 Ceiling, Vanadium Pentoxide, respirable dust 0.1 Ceiling, Vanadium Pentoxide, respirable fume	0.05 Vanadium Pentoxide, respirable dust and fume
Tungsten (W) CAS No. 7440-33-7	0-2.5	15, total dust (PNOR) 5, respirable fraction (PNOR) (not regulated)	1 mg/m ³ , 3 mg/m ³ STEL soluble W compounds (as W) 5 mg/m ³ , 10 mg/m ³ STEL insoluble W compounds (as W)
Tantalum (Ta) CAS No. 7440-25-7	0-1.0	5, metal and oxide dust (as Ta)	5, metal and oxide dust (as Ta)
Titanium (Ti) CAS No. 7440-32-6	0-2.4	15, Titanium Dioxide, total dust	10, Titanium Dioxide, total dust

Cladding/Core (Carbon Steel)

Carbon (C) CAS No. 7440-44-0	0.01-0.025	15, total dust (PNOR) 5.0, respirable fraction (PNOR)	10, inhalable fraction (PNOC) 3, respirable fraction (PNOC)
Manganese (Mn) CAS No. 7439-96-5	0.03 max	See above	See above
Aluminum (Al) CAS No. 7429-90-5	0.02-0.07	See above	See above
Titanium (Ti) CAS No. 7440-32-6	0.07-0.095	See above	See above
Columbium (Cb) CAS No. 7440-03-1	0.02-0.04	See above	See above
Iron (Fe) CAS No. 7439-89-6	Balance	See above	See above

Note: Above includes Stainless Steel Cladding/Core

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Precision Brand Products, Inc.

MSDS: Stainless Steel Products; Product codes 20,22,42,72,77. 82 & 83

SECTION 2 – COMPOSITION/INFORMATION ON INGREDIENTS (Cont.)

Notes: 1) All exposure limits are 8-hour TWAs unless otherwise specified. 2) As defined by OSHA, STEL (Short Term Exposure Limit) is an employee's fifteen-minute, time-weighted average exposure which must not be exceeded during a workday. 3) 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: Sulfur, Phosphorous, Nitrogen, Aluminum, Arsenic, Boron, Cadmium, Calcium, Lead, Nitrogen, Phosphorous, Sulfur, Tin and Zirconium. Abbreviations and acronyms are defined in Section 16.

(*) Steel products as provided contain chromium metal in the zero valence state. As such, chromium metal does not present any unusual health hazard. Hence, the most applicable exposure limits relative to chromium in these products is those established for the metal, itself. However, welding, torch cutting, brazing or perhaps grinding of the chromium metal in stainless steel products may generate airborne concentrations of hexavalent chromium, (Cr⁶⁺), a confirmed human carcinogen. Therefore, should the user perform any of these tasks, the hexavalent chromium exposure limits would apply.

SECTION 3 – HAZARDS IDENTIFICATION

GENERAL HAZARD STATEMENT: Solid metallic products distributed by Precision Brand Products, Inc. are generally classified as "articles" and do not constitute a hazardous material in solid form under the terms of the OSHA Hazard Communication Standard. Any articles manufactured from these solid products would be generally classified as non-hazardous. However, some metallic elements contained in these products have been determined to be toxic and are subject to regulatory controls. These elements can be emitted as airborne contaminants under certain conditions such as burning, melting, cutting, sawing, brazing, grinding, milling, machining.

Certain materials and equipment utilized in processing of steel product (cutting/machining fluids, coatings, processing lubricants, cleaning/pickling chemicals, welding fluxes, torch and plasma cutting systems) may constitute a health hazard and should be treated accordingly.

EMERGENCY OVERVIEW: Odorless solid product in various forms, silver-gray color. This formed solid metal product poses little or no immediate health or fire hazards. Product may be coated – refer to appropriate coating MSDS for physical and health hazards. When product is subjected to welding, burning, melting, sawing, brazing, grinding, or other similar processes, potentially hazardous airborne particulate and fumes may be generated. These operations should be performed in well-ventilated areas, and if appropriate, respiratory protection and other PPE should be utilized.

PRIMARY ROUTE OF ENTRY: Inhalation of dust or fume during welding, burning, melting, cutting, brazing, grinding, machining and other operations.

Note: The composition of fumes from welding are dependent not only on the metal being welded, but also on the welding process and electrodes used. A full health hazard assessment should be performed by a competent health and safety professional for all welding and other operations performed on this product.

Acute Effects of Overexposure**INHALATION:**

- Exposures to high concentrations of metallic fumes and dusts may result in irritation of the respiratory tract and/or sensitization of the lungs and other mucous membranes.
- Excessive inhalation of fumes from many metals can produce an acute reaction known as "metal fume fever" (symptoms shown below under *SIGNS AND SYMPTOMS OF OVEREXPOSURE*.)

EYE:

- Exposure to high concentration of fumes or dusts may cause irritation and/or sensitization.

SKIN:

- Exposure to dust may cause irritation or sensitization, possibly leading to dermatitis.

INGESTION:

- Ingestion of harmful amounts of product as distributed is unlikely due to its solid, insoluble form. Ingestion of dust may cause nausea and/or vomiting. Serious effects may occur if large amounts of dust are swallowed.

Chronic Effects of Overexposure**EXCESSIVE AND REPEATED EXPOSURES TO FUME OR DUST GENERATED DURING PROCESSING MAY CAUSE:**

- Allergic sensitization – dermatitis and asthma
- Lung inflammation and damage – pneumonitis, pneumonia, bronchitis, siderosis (benign lung disease caused by inhaling iron particles)
- Nasal perforation and nasal cavity damage
- Eye inflammation
- Central nervous system damage, possibly permanent
- Kidney damage
- Liver damage
- Gout – inflammation of the joints (associated with some metals)

CARCINOGENICITY:

- The carcinogenicity of this solid products as a whole has not been established
- Individual components and some compounds of these elemental metals have been associated with carcinogenicity by NTP and IARC.

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- No component greater than 0.1% by weight within this solid product is regulated by OSHA within 29 CFR 1920 Subpart Z as a carcinogen.

SYNERGISTIC MATERIALS: Inhalation of high concentrations of Iron Oxide may possibly enhance the risk of lung cancer development in workers exposed to pulmonary carcinogens.

SIGNS AND SYMPTOMS OF OVEREXPOSURE:

- Redness, swelling, itching, and/or irritation of skin and eyes.
- Respiratory difficulties – coughing, wheezing, shortness of breath, dyspnea, decreased pulmonary function.
- Metal fume fever – symptoms include chills and fever (very similar and easily confused with flu symptoms), a metallic taste in the mouth, dryness, and irritation of the throat. The symptoms occur a few hours after excessive exposures and usually last from 12 to 48 hours. Long term effects from metal fume fever have not been noted in the literature.
- Central nervous system effects may show languor, sleepiness, weakness, emotional disturbances, spastic gait, paralysis.
- Kidney damage may be seen as changes in urine output and appearance, lower back pain, and edema (swelling from fluid retention).
- Liver damage may be seen by loss of appetite, jaundice (yellowish skin color) and occasional pain in the upper abdomen on the left side.
- Anorexia and weight loss.

NOTE: For specific toxicological and other chronic effects information concerning the components of this solid steel product, refer to SECTION 11, TOXICOLOGICAL INFORMATION.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: For airborne fume and dust, preexisting diseases of the lungs, skin, eyes, and other mucous membranes. Inhalation of high concentrations of Iron Oxide may possibly enhance the risk of lung cancer development in workers exposed to pulmonary carcinogens.

SECTION 4 – FIRST AID MEASURES

INHALATION: If overexposure occurs, immediately remove victim from the adverse environment to fresh air and seek medical attention. If breathing has stopped, certified individuals should perform CPR. Keep affected person warm and at rest.

EYE: Immediately flush with large amounts of running water for several minutes. Seek prompt medical attention.

SKIN: If dust gets on skin, wash contaminated area with soap and water. Remove and wash contaminated clothing. If a persistent rash or irritation occurs, seek medical attention.

INGESTION: Get medical attention immediately.

SECTION 5 -- FIRE FIGHTING MEASURES

Flash Point and Method Used:
N/A

Auto-Ignition Temperature: N/A

General Fire Hazard:
None for solid formed product

Flammability Limits:
N/A

Flammability Classification:
N/A

Extinguishing Method: For solid formed product, as appropriate for surrounding fire. A fire involving finely divided particles should be treated as a Class D combustible metal fire. Fire should be extinguished by a properly trained and experienced firefighter. Proper care should be taken in applying extinguishing agent and in allowing to burn itself out.

Fire Fighting Equipment: For solid formed product, as appropriate for surrounding fire. Positive pressure SCBA and structural firefighter's protective clothing should be used at a minimum for surrounding fire.

Unusual Fire or Explosion Hazards: This solid formed product does not constitute a fire or explosion hazard. Finely divided, suspended particulate may present a fire and explosion hazard in the presence of an ignition source. In addition, applied coatings may be combustible. For fires involving coated product, consult the appropriate coating MSDS.

Finely divided product (e.g. dust, shavings, etc.) may be combustible. May be ignited by heat, sparks, or flames. May burn rapidly with flare-burning effect. Fire may produce irritating or poisonous gases. High concentrations of airborne dust in an enclosed area can explode or burn if exposed to a source of ignition. Care should be taken to avoid the generation of airborne dust. Use of water on finely divided product may cause explosive hydrogen gas and heat to be evolved.

Explosion Data: *Sensitivity/Mechanical Impact:* N/A for solid product. *Sensitivity/Static Discharge:* N/A for solid product.

Hazardous Combustion Products: N/A for solid formed product. Toxic metal and metallic oxide fumes may be evolved from fires involving finely divided particles and during torch-cutting operations.

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SECTION 6 – ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED: Minimal problems with spills of this product would occur because of its solid form. The following precautions apply to spills involving finely divided particles:

- Shut off ignition sources; no flares, smoking or flames should be in or near hazard area.
- Do not touch or walk through spilled material. Clean up using methods which avoid dust generation.
- Compressed air should not be used to clean up spills
- During clean up, skin and eye contact and inhalation of dust should be avoided as much as possible.
- Provide local exhaust or dilution ventilation as required.
- Appropriate PPE should be worn during clean up if exposure limits are exceeded (see *SECTION 8, EXPOSURE CONTROLS/PERSONAL PROTECTION*.)
- Collect material in compatible and appropriately labeled containers.
- For small dry spills, place material into clean dry container with a clean shovel, and cover loosely; move container from spill area.
- Comply with federal, state, and local regulations regarding spills and waste disposal.

SECTION 7 – HANDLING AND STORAGE

HANDLING: Avoid breathing of and contact with fumes and dusts during processing. No specific requirements for solid formed steel product.

STORAGE: Keep away from incompatible materials (see *SECTION 10, STABILITY AND REACTIVITY*). No other specific storage procedures are required for solid formed product.

SECTION 8 – EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls: Local and/or general exhaust ventilation should be used to keep worker exposure below applicable exposure limits (See *SECTION 2, COMPOSITION/INFORMATION ON INGREDIENTS*) during welding, brazing, grinding, machining, and other processes, which may generate airborne contaminants.

Respiratory: When engineering or administrative controls cannot maintain exposures below permissible limits during welding, brazing, machining, and other processes which may generate airborne contaminants or while being instituted, use an appropriate NIOSH/MSHA approved respirator. If respiratory protection is required, all appropriate requirements as set forth in 29 CFR 1910.134 must be met. (For Canada consult CSA Standard Z94.4-M1982 "Selection, Care, and Use of Respirators" for assistance.) A competent health and safety professional should be consulted for respirator selection, fit testing, and training. Use a NIOSH-approved positive-pressure, air-supplied respirator if exposure levels are unknown, or any other circumstance where an air-purifying respirator would not be adequate.

Gloves: Suitable for protection against physical injury and skin contact during handling and processing.

Eye Protection: Safety glasses or goggles when there is a reasonable probability of flying particles or high levels of airborne dust or fume.

Other Protective Clothing or Equipment: Adequate footwear (safety shoes if necessary) and clothing that protects skin from prolonged or repeated contact. Change clothing if there is a reasonable probability of contamination.

SECTION 9 -- PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point: NIF for steel product (Fe-5432/Cr-3992/Ni-5252 °F)

Specific Gravity (H₂O = 1): 7 - 9

Vapor Pressure (mm Hg @ 68 °F): Negligible

Evaporation Rate : N/A

Vapor Density (Air = 1): N/A

Solubility in Water: Insoluble

Melting Point: 2500-2800°F

pH: N/A

Appearance and Odor : Silver-gray metallic solid form, odorless

SECTION 10 – STABILITY AND REACTIVITY

Stability: Stable under normal conditions of use, storage and transport for solid formed product.

Conditions To Avoid: Contact with incompatible materials. Avoid creating finely divided concentrated airborne particulate in the presence of ignition sources.

Incompatible Materials: Oxidizers. Reacts with strong acids to form explosive hydrogen gas and heat.

Hazardous Decomposition Products: Extreme heat from fire or processing (e.g. welding, brazing, machining, etc.) may produce toxic or irritating airborne particulate, including metal and metallic oxide fumes. Reaction of some metals with water, steam, acids, etc. can evolve hydrogen, which is a highly dangerous fire and explosion hazard.

Hazardous Polymerization: Will not occur

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SECTION 11 – TOXICOLOGICAL INFORMATION

Iron: Excessive exposure of eyes to airborne iron dust can cause conjunctivitis, choroiditis, and retinitis. Chronic inhalation of excessive concentrations of iron oxide fumes or dusts may result in development of a benign pneumoconiosis, called siderosis, which is observable via x-ray. No physical impairment of lung function has been associated with siderosis. Inhalation of excessive concentrations of iron oxide may enhance the risk of lung cancer development in workers exposed to pulmonary carcinogens. LD50 (oral, rat) – 30 gm/kg; LC50 – NIF.

Nickel: Nickel fumes are respiratory irritants and may cause pneumonitis. Exposure to nickel and its compounds may result in the development of dermatitis known as "nickel itch" in sensitized individuals. The first symptom is usually itching, which occurs up to 7 days before skin eruption occurs. The primary skin eruption is erythematous, or follicular, which may be followed by skin ulceration. Nickel sensitivity, once acquired, appears to persist indefinitely. LC50 – NIF; LC50 (oral) – NIF.

Carcinogenicity – Nickel and certain nickel compounds have been listed by NTP as being reasonably anticipated to be carcinogens. IARC has listed nickel compounds within group 1 (there is sufficient evidence for carcinogenicity in humans) and nickel within group 2B (agents which are possibly carcinogenic to humans). Nickel is not regulated as a carcinogen by OSHA (29 CFR 1910 Subpart Z). Based upon recent epidemiological data, ACGIH (1998) has designated elemental nickel as category A5, not a suspected human carcinogen.

Chromium: The health hazards associated with exposure to chromium are dependent on its oxidation state. The metal form of chromium as it exists in these products is of low toxicity. Animal toxicology studies to airborne concentrations of 0, 0.6 and 3.1 mg/m³ to chromium metal where 60% to 80% of the airborne particles were 7µm or less in size, revealed no chromium-related effects in the lungs of alveolar macrophage structure or function. Chromium was observed to be readily phagocytosed by alveolar macrophages. LD50 (oral) – NIF; LC50 – NIF.

Carcinogenicity – Chromium metal and trivalent chromium (Cr⁺³) compounds are not classifiable as human carcinogens. However, welding, torch cutting, brazing or perhaps grinding of the chromium metal in stainless steel products may generate airborne concentrations of hexavalent chromium (Cr⁺⁶), a confirmed human carcinogen. IARC lists hexavalent chromium compounds as Group 1 (sufficient evidence for carcinogenicity in humans). NTP lists certain hexavalent chromium compounds as Group 1 (known to be carcinogenic). The American Conference of Governmental Industrial Hygienists (ACGIH) lists hexavalent chromium compounds as A1 (confirmed human carcinogen).

Molybdenum: Based on animal experiments, molybdenum and its compounds are highly toxic. Some evidence of liver dysfunction with hyperbilirubinemia has been reported in workmen chronically exposed in a Soviet Mo-Cu plant. In addition signs of gout have been found in factory workers and among inhabitants of Mo-rich areas of Armenia. The main features were joint pains in the knees, hands, feet, articular deformities, erythema, and edema of the joint areas. LD50 (oral) – NIF; LC50 – NIF.

Copper: Industrial exposure to copper fumes, dusts, or mists may result in metal fume fever with atrophic changes in nasal mucous membranes. Chronic copper poisoning results in Wilson's Disease, characterized by a hepatic cirrhosis, brain damage, demyelination, renal disease, and copper deposition in the cornea. Copper fume (respirable) has appeared on the ACGIH Notice of Intended Changes (1996 & 1997). The intended ACGIH TLV for respirable copper fume is 0.05 mg/m³. LD50 (oral) – NIF; LC50 – NIF.

Manganese: Chronic manganese poisoning may result from prolonged inhalation of manganese dust and fumes. The central nervous system is the chief site of damage from the disease, which may result in permanent disability. Symptoms include languor, sleepiness, weakness, emotional disturbances, spastic gait, recurring leg cramps, and paralysis. A high incidence of pneumonia and other upper respiratory infections has been found in workers exposed to dust or fume of manganese compounds. Manganese compounds are experimental equivocal tumorigenic agents. LD50 (oral, rat) – 30 gm/kg; LC50 – NIF; TLo – 2300 µg/m³ (man).

Silicon: Elemental silicon is an inert material, which appears to lack the property of causing fibrosis in lung tissue. However, slight pulmonary lesions have been reported in laboratory animals from intratracheal injections of silicon dust. Silicon dust has little adverse effect on lungs and does not appear to produce significant organic disease or toxic effects when exposures are below permissible limits. Silicon may cause chronic respiratory effects. Crystalline silica (silicon dioxide) is a potent respiratory hazard. However, the likelihood of crystalline silica generation during normal processing is very remote. LD50 (oral) – 3160 mg/kg rat; LC50 – NIF.

Columbium: Interferes with calcium as an activator of enzyme systems. LD50 (oral) – NIF; LC50 – NIF.

Vanadium: Chronic exposure to Vanadium Pentoxide dust and fume may cause severe irritation of the eyes, skin, and upper respiratory tract, emphysema, tracheitis, pulmonary edema, bronchial pneumonia, and systemic poisoning. Signs and symptoms of overexposure include conjunctivitis, nasopharyngitis, cough, dyspnea, palpitation, lung changes, chronic bronchitis, skin pallor, greenish-black tongue and an allergic skin rash. The pentavalent Vanadium compounds, such as Vanadium Pentoxide, and vanadates, are more toxic than other forms. A lethal dose by intravenous administration to the rabbit is about 1.5 mg/kg. Rats taking 24 ppm in the diet show early signs of poisoning. Vanadium Pentoxide to five human volunteers found severe upper respiratory tract irritation in the form of persistent productive cough and increased mucous. Vanadium is an experimental equivocal tumorigenic agent for rats. LD50 (oral) – 10 mg/kg, rat; LC50- NIF.

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. LD50 (intraperitoneal) – 5 g/kg rat; LC50 – NIF.

Tantalum: The passivity of Tantalum metal for biological tissues has been amply demonstrated by its longtime use in surgical procedures both in animals and man. LD50 (oral) – NIF; LC50- NIF. No significant toxic effects have been associated with tantalum.

Aluminum: Inhalation of finely divided aluminum and aluminum oxide powder has been reported as a cause of pulmonary fibrosis and lung damage. This effect, known as Shaver's Disease, is complicated by the presence in the inhaled air of silica and oxides of iron. May also be implicated in Alzheimer's disease. LD50 (oral) – NIF; LC50 – NIF.

Titanium: Elemental titanium and titanium dioxide is of a low order of toxicity. Laboratory animals (rats) exposed to titanium dioxide via inhalation have developed small localized areas of dark-colored dust deposits in the lungs. Excessive exposure in humans may result in slight changes in the lungs. LD50 (oral) – NIF; LC50- NIF.

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CLADDING/CORE**Carbon:** Chronic inhalation of high concentrations to carbon may cause pulmonary disorders. LD50 (oral) – NIF; LC50 –NIF.**Manganese:** Refer to above health hazard information**Aluminum:** Refer to above health hazard information**Titanium:** Refer to above health hazard information**Columbium:** Refer to above health hazard information**Iron:** Refer to above health hazard information**SECTION 12 – ECOLOGICAL INFORMATION**

N/A for solid steel product in its as shipped form. Articles produced from solid product are not an ecological hazard. NIF on specific products to establish its effect if released into the environment in finely divided form. It is believed that finely divided product, 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, material may be ingested by wildlife, with possible toxic effects. The solid product is not expected to migrate easily into soil or ground water based upon its insoluble form, however, finely divided material can become mobile in water and contaminate soil and ground water. This material may persist in the environment for long periods, based upon its corrosion resistant, insoluble and non-biodegradable properties. In addition, heavy metals may contaminate the food chain and ultimately be consumed by humans. Some components will react with oxygen to form metallic oxides; the rate of oxidation depends upon prevailing conditions. Iron oxidizes most rapidly in moist air. Metallic particulate discharged to a POTW may pass-through of contaminate sewage sludge, may interfere with the treatment system process, and may be non-compliant with a POTW permit or other regulations.

SECTION 13 – DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD: If product as shipped becomes a solid waste, it would not be classified as a hazardous waste, and should be recycled. Product dusts from 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 261 and possibly more restricting state and/or local regulations. Solid waste generated from product processing should be classified by a competent environmental professional and disposed, processed, or recycled in accordance with federal, state and local regulations.

SECTION 14 – TRANSPORT INFORMATION**Hazardous Materials Description/Proper Shipping Name:** N/A for solid formed product.**Hazard Class:** N/A for solid formed product.**Identification No.:** N/A for solid formed product.**SECTION 15 – REGULATORY INFORMATION****Canadian Federal Regulations (not all-inclusive):****WHMIS CLASSIFICATION:** Controlled Product Hazard Class D2B. This MSDS has been prepared in compliance with the Controlled Products regulations.**Selected U.S. Federal and State Regulations (not all-inclusive):****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.**SARA Title III Section 313 Reportable Substances:** Nickel, Chromium, Cobalt, are subject to reporting requirements. (Aluminum (qualified as fume or dust), Manganese and Copper are less than the 1% minims level.)**CERCLA Hazardous Substances:** Nickel* (threshold 100 lbs.), Chromium* (threshold 5000 lbs.), and Copper* (threshold 5000 lbs.).

* Note: CERCLA reporting only if diameter of particles released is less than 100 micrometers.

Pennsylvania R-T-K List: Listed components (greater than 0.1% by weight) – Aluminum (E), Manganese (E), Molybdenum, Nickel (E,S), Silicon, Chromium (E,S), Cobalt (E), Copper (E), and Tungsten. E – Environmental hazard, S – Special Hazardous Substance.**New Jersey R-T-K Environmental Hazardous Substance List:** Listed components – Aluminum (as dust and fume), Chromium, Cobalt, Copper, Manganese, and Nickel.**California Proposition 65:** Listed possible trace (must less than 0.1% by weight) elements known by the state to cause cancer – Arsenic (inorganic), Cadmium, Lead. Listed possible trace elements known by the state to cause reproductive toxicity – Lead. Listed components known by the state to cause cancer – Nickel, Cobalt (metal powder). Listed components known by the state to cause reproductive effects – None.

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SECTION 16 – OTHER INFORMATION

	Health	Flammability	Reactivity	PPE
NFPA RATING (for solid formed product):	1	0	0	
HMIS RATING (for solid formed product):	1	0	0	B

Abbreviations / Acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists	NIF	No Information Found
CAS	Chemical Abstracts Service	NIOSH	National Institute for Occupational Safety and Health
CFR	Code of Federal Regulations	NTP	National Toxicology Program
CPR	Cardiopulmonary Resuscitation	OSHA	Occupational Safety and Health Administration
CSA	Canadian Standards Association	PEL	Permissible Exposure Limit
EST	Eastern Standard Time	PNOR	Particulate Not Otherwise Regulated
HMIS	Hazardous Materials Identification System	PNOC	Particulate Not Otherwise Classified
IARC	International Agency for Research on Cancer	POTW	Publicly Owned Treatment Works
MSDS	Material Safety Data Sheet	PPE	Personal Protective Equipment
MSHA	Mine Safety and Health Administration	SCBA	Self-Contained Breathing Apparatus
NFPA	National Fire Protection Association	STEL	Short-Term Exposure Limit
N/A	Not Applicable	TLV	Threshold Limit Value
NIA	No Information Available.	TWA	Time-Weighted Average

Note: The percent composition in Section 1 reflects the range that is possible within this GROUP of products. These are not the technical specifications for a particular product. Also, specific grades may not include all of the hazardous ingredients in Section 1.

DISCLAIMER: The information contained herein is provided in good faith and is believed to be correct as of the date hereof. However, Precision Brand Products, Inc. makes no representation as to the comprehensiveness or accuracy of the information. It is expected that individuals receiving the information will exercise their independent judgment in determining its appropriateness for a particular period. Accordingly, Precision Brand Products, Inc. will not be responsible for damages of any kind resulting from the use of or reliance upon such information. NO REPRESENTATIONS, OR WARRANTIES, EITHER EXPRESSED OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER NATURE ARE MADE HEREUNDER TO WHICH THE INFORMATION REFERS. The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment.