H&H TUBE

March 1, 2018

Dear Customer:

The enclosed Safety Data Sheets (SDS) have been prepared in compliance with the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200. Please direct them to the person responsible for health and safety within your organization. Please note that the SDS contains information regarding toxic chemicals subject to the reporting requirements of Section 313 of EPCRA and 40 CFR part 373.

SDS's are invaluable tools in the hands of health and safety professionals for hazard evaluation in the confines of the workplace. The general public must exercise caution, however, against direct extrapolation of SDS health hazard data to the community outside the workplace. In these instances, health, safety and environmental professionals should be consulted to interpret SDS data.

The alloy composition information contained in these SDS's is intended for employee health and safety education and is not for material specification purposes.

Sincerely,

Cheri Wilhelm

Cheri Wilhelm
Safety Director

SECTION I. MATERIAL IDENTIFICATION

Name of the product: Copper/Copper Alloys
Recommended use: Fabricated metal products
Producer: H&H Tube
579 Garfield St.
Vanderbilt, MI 49795

Telephone: 011-1-989-983-2800
Emergency: 011-1-989-983-2800

SECTION 2. HAZARD(S) IDENTIFICATION

Classification: Copper/Copper Alloys: Dust and Fumes
Non-hazardous in solid form

Cat. 1 Target organ toxicity
Cat. 2 Carcinogen
Cat. 2 Mutagen
Cat. 1 Skin sensitizer
Cat. 1 Respiratory sensitizer
Cat. 2A Eye irritant

Pictogram:

Dust or Fume

Signal Word: DANGER

Hazard Statement:

Irritating to skin, mucous membrane, respiratory system, eyes
Toxic if inhaled
May cause genetic defects
Suspected of causing cancer if inhaled
Inhalation/Ingestion may cause damage to lungs, liver, CNS, spleen, lymph nodes

Precautionary Statements:

Prevention: Wear appropriate gloves for task, wash skin thoroughly with soap and water, use local exhaust, if not maintained below legal limits use appropriate respirator for task.
Do not ingest-wash hands thoroughly after handling, before eating, smoking, or applying cosmetics.

Response: Eye-flush with water & get medical attention, Skin-vacuum excess dust, wash well with soap and water, Inhalation- remove to fresh air, get medical attention, Ingestion-seek medical attention attention if large quantities where ingested.

Storage: Store away from incompatible materials and keep dust away from source of ignition.

Disposal: Waste Disposal Method: Dispose of in accordance with federal, state and local regulations.
Cleanup personnel should wear respirators and protective clothing. Ventilate area of release.

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

COPPER/COPPER ALLOY % COMPOSITION

ALLOY	CU	LEAD PB	IRON Fe	TIN Sn	ZINC Zn	PHOS P	ARS As	NICKEL Ni	MAG Mn	ALUM Al	TRACE	SPEC
194 IRON	97.0 MIN	0.03 MAX	2.1 2.6		0.05 0.20	0.015 0.15						
360 FITTING	60.0 63.0	2.5 3.7	0.35 MAX		REM							B16
444 ANT	70.0 73.0	0.07 MAX	0.06 MAX	0.9 1.2	REM		0.02 .1SB					B111
464 NAVAL	59.00 62.00	0.20 MAX	0.15 MAX	0.50 1.00	REM							B21
740 NI AG	69.0 73.5	0.010 MAX	0.25 MAX		REM			9.0 11.0	0.5 MAX			B122
752 NI AG	63.0 66.5	0.05	0.25		REM			16.5 19.5	0.5 MAX			B151
90 - 10 706 - CUNI	REM	0.05 MAX	1.0 1.8		1.0 MAX			9.0 11.0	1.0 MAX			B111
70 - 30 715-CUNI	MAX	0.05 MAX	0.40 1.0		1.0 MAX			29.0 33.0	1.0 MAX			B111

COPPER/COPPER ALLOY % COMPOSITION

ALLOY	CU	LEAD PB	IRON Fe	TIN Sn	ZINC Zn	PHOS P	ARS As	NICKEL Ni	MAG Mn	ALUM Al	TRACE	SPEC
102 CU	99.95 MIN										REM	
110 CU	99.75 MIN										REM	
120 CU	99.90 MIN					0.004 0.012						B75
122 CU	99.9 MIN					0.015 0.040						B75
220 BRONZE	89.0 91.0	0.05 MAX	0.05 MAX		REM							
230-85/15	84.0 86.0	0.05 MAX	0.05 MAX		REM							B135
260-70/30	68.5 71.5	0.07 MAX	0.05 MAX		REM							B135
270	63.0 68.5	0.10 MAX	0.07 MAX		REM							B135
272 BRASS	62 65	0.07 MAX	0.07 MAX		REM							B135
330-L/L	65.0 68.0	0.25 0.7	0.07 MAX		REM							B135
332-HI/L	65.0 68.0	1.5 2.5	0.07 MAX		REM							B135
443-ARS	70.0 73.0	0.07 MAX	0.06 MAX	0.9 1.2	REM		0.02 0.06					B111

SECTION 4. FIRST-AID MEASURES

EMERGENCY FIRST AID PROCEDURES:

Eye Contact- Flush well with running water to remove particulate. Get medical attention

Skin Contact- Vacuum excess dust. Wash well with soap and water.

Inhalation- Remove to fresh air. Get medical attention

Ingestion- Seek medical attention if large quantities of materials have been ingested.

SECTION 5. FIRE-FIGHTING MEASURES

Flash Point: (Method Used) Not Applicable

Extinguishing Media: See Below

Flammable Limits (LEL-UEL) Not Applicable

Auto Ignition Temp.- Not Applicable

Special Fire Fighting Procedures: Solid massive form is not combustible. Fire and explosion hazards are moderate when material is in the form of dust and exposed to heat, flames, chemical reaction, or in contact with powerful oxidizers . Use special mixtures of dry chemical or sand. Firefighters should wear NIOSH/MSHA self-contained breathing apparatus and protective clothing. Molten metal may react violently with water.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Steps to be Taken in Case Material is Released or Spilled: No special precautions are necessary for spills of bulk material. If large quantities of dust are spilled, remove by vacuuming or wet sweeping to prevent heavy concentration of airborne dust. If liquids (acids or bases) containing solubilized metal are spilled evacuate unprotected personnel from area. Absorb liquid by means of vermiculite, dry sand or similar material. Follow federal, state, and local regulations concerning the disposal of waste.

SECTION 7. HANDLING & STORAGE

Precautions to be Taken in Handling and Storing: Store material away from incompatible materials and keep dust from sources of ignition

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Copper/Copper Alloys	CAS Number		OSHA-PEL 8-HR TWA	ACGIH-TLV 8-HR TWA (1988-89)	ACGIH STEL (1988-89)
Aluminum	(7429-90-5)	(Dust)	15 mg/m^3	10 mg/m^3	n/a
		(Fume)	5 mg/m^3	5 mg/m^3	n/a
Antimony #	(7440-36-0)		0.5 mg/m^3	0.5 mg/m^3	n/a
Arsenic #	(7440-38-2)		0.5 mg/m^3	0.02 mg/m^3	n/a
Beryllium #	(7440-41-7)		0.002 mg/m^3	0.002 mg/m^3	0.005*
Bismuth Telluride	(1340-82-1)	(Dust)	15 mg/m^3	15 mg/m^3	n/a
Boron Oxide	(1303-86-2)	(Dust)	15 mg/m^3	10 mg/m^3	n/a
Cadmium #	(7440-43-9)	(Dust)	0.2 mg/m^3	0.05 mg/m^3	n/a
		(Fume)	0.1 mg/m^3	0.05 mg/m^3	n/a
Calcium Oxide	(1305-78-8)		5 mg/m^3	5 mg/m^3	n/a
Carbon Black	(1333-86-4)		3.5 mg/m^3	n/a	n/a
Chromium #	(7440-47-3		1 mg/m^3	0.5 mg/m^3	n/a
Cobalt #	(7440-48-4)		0.05 mg/m^3	0.1 mg/m^3	n/a
Copper #	(7440-50-8)	(Dust)	1 mg/m^3	1 mg/m^3	n/a
		(Fume)	0.1 mg/m^3	0.2 mg/m^3	n/a
Iron	(1309-37-1)		10 mg/m^3	5 mg/m^3 (As iron oxide fume)	n/a
Lead # (3)	(7439-92-1)		0.05 mg/m^3	0.15 mg/m^3	n/a
Lithium Hydride	(7580-67-8)		0.025 mg/m^3	0.025 mg/m^3	n/a
Manganese #	(7439-96-5	(Dust)	5 mg/m^3	5 mg/m^3	n/a
		(Fume)	n/a	1 mg/m^3	3 mg/m^3
Magnesium Oxide	(1309-48-4)	(Dust)	15 mg/m^3	10 mg/m^3	n/a
Nickel #	(7440-02-0)		1 mg/m^3	1 mg/m^3	n/a
Phosphorus #	(7723-14-0)		0.1 mg/m^3	0.01 mg/m^3	n/a
Selenium	(7782-49-2)		0.2 mg/m^3	0.2 mg/m^3	n/a
Silicon	(7440-21-3)	(Dust)	10 mg/m^3	10 mg/m^3 (1)	n/a
		(Fume)	5 mg/m^3	n/a	n/a
Silver #	(7440-22-4)		0.01 mg/m^3	0.1 mg/m^3	n/a
Sulfur Dioxide	(7446-09-5)		5 mg/m^3	5 mg/m^3	5/10 mg/m^3
Tellurium #	(13494-80-9)		0.1 mg/m^3	0.1 mg/m^3	n/a
Tin (2)	(7440-31-5)		2 mg/m^3	2 mg/m^3	0.2 mg/m^3 (contemplated)
Titanium Dioxide	(13463-67-7)	(Dust)	15 mg/m^3	10 mg/m^3	n/a
Zinc #	(7440-66-6)	(Dust) (1)	10 mg/m^3	10 mg/m^3	n/a
		(Fume)	5 mg/m^3	5 mg/m^3	10 mg/m^3
Zirconium	(7440-67-7)		5 mg/m^3	5 mg/m^3	10 mg/m^3

*** Ceiling Limit**

Note: antimony trioxide, beryllium, cadmium, chromium, cobalt chromium alloy, lead and nickel have been identified as potential human carcinogens,

# denotes a toxic chemical or chemicals subject to reporting requirements of Section 131 of Title III of the S.A.R.A. of 1986 and CFR Part 372.

(1) Value is for total dust containing no asbestos and less than 1% free silicon

(2) Contemplated change to 0.2 STEL and 0.1 TWA

(3) Under court remand

PERSONAL PROTECTION:

Respiratory Protection: If exposure above the PEL or TLV, NIOSH/MSHA approved respirator for fume or dust, dependent upon the source of airborne contaminant.

Ventilation: Required if dust or fume created in handling or working on this material.

Local Exhaust: Required if dust or fume created in handling or working on this material and threshold limits are being approached.

Mechanical (general): As above to reduce airborne dust or fume levels.

Protective Gloves: Required for melt, grind, cut or weld operations. Select glove approved for the specific operation

Eye Protection: Required for melt, grind, cut or weld operations. Minimum requirements of safety glasses with side shields for these operations Melting/welding may require special eye protection including face shields and specially tinted glass. Grinding operations may also require face shields.

Other Protective Clothing or Equipment: As required for the work done on or with the metal.

Work/Hygiene Practices: As required for the work done with lead bearing materials. Meet requirements of the OSHA lead standard where necessary. Always evaluate the jobs done on this product in accordance with OSHA or relevant state, federal, or local standards.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Form:	Solid	**Specific Gravity:**	7.45-9.00
Boiling Point:	Not Applicable	**Vapor Density:**	Not Applicable
Freeze-Melt Temperature:	Approx. 1290 - 2260^0 F	**Solubility in H_2O:**	Insoluble
Vapor Pressure:	Not Applicable	**Color:**	Silver or Yellow to Red
Evaporation Rate:	Not Applicable	**Odor:**	None

SECTION 10. STABILITY & REACTIVITY

Stability : Stable

Conditions to Avoid: Stable under normal conditions of transport and storage. Molten metal may react violently with water.

Incompatibility (Materials to Avoid): Acids, bases, and oxidizers.

Hazardous Decomposition or Byproducts: Metal fume.

Hazardous Polymerization: Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

Permissible exposure limits and threshold limit values. SEE SECTION 8

Route(s) of Entry: **Inhalation: Yes** **Skin: Yes** **Ingestion: Yes**

110 BASE

For Product: The toxicological properties of this product have not been thoroughly investigated.		**For Components:**	
		Copper	**Boron**
Oral LD_{50}	Believed to be > 5 g/kg	3.5 mg/kg (mouse, intraperitoneal)	650 mg/kg (rat)
Dermal LD_{50}	Believed to be >2 g/kg	375 mg/kg (rabbit, subcutaneous)	No Data
Inhalation LC_{50}	Believed to be slightly to moderately toxic	No Data	No Data
Irritation	Eye and Respiratory irritant, sensitizer	Respiratory irritant	No Data

120/122 BASE

LD50 (Species, Route)	**LC50 (Species)**	**Mutagenicity**
Copper: 3.5 mg/kg (mouse, intraperitoneal)	Not Available	Not positive in Ames test

220/230/260/270 BASE

For Product: (dust or fume):		**For Components**		
		Copper	**Lead**	**Zinc**
Oral LD_{50}	Believed to be moderately toxic	3.5 mg/kg (mouse, intraperitoneal)	No Data	No Data
Dermal LD_{50}	Believed to be > 2 g/kg	375 mg/kg (mouse, subcutaneous)	No Data	No Data
Inhalation LC_{50}	Believed to be slightly to moderately toxic	No Data	No Data	No Data
Irritation	Believed to be an eye and respiratory irritant	Respiratory Irritant	Not Irritating	Eye Irritant

330 BASE

For Products (for dust or fume)		For Components				
		Copper	**Lead**	**Zinc**	**Nickel**	**Arsenic**
Oral LD_{50}	Believed to be 1-3 g/kg, moderately toxic	3.5 mg/kg (mouse, intraperitoneal)	No Data	No Data	> 5 g/kg (rat)	750 mg/kg (rat)
Dermal LD_{50}	Believed to be >2 g/kg	375 mg/kg (rabbit, subcutaneous)	No Data	No Data	> 7.5 g/kg (rabbit, subcutaneous)	No Data
Inhalation LC_{50}	Believed to be moderately toxic	No Data	No Data	No Data	> 12 mg/kg (rat, intratracheal)	No Data
Irritation	Eye and respiratory irritant	Respiratory Irritant	Respira-tory Irritant	Eye Irritant	Respiratory irritant Skin sensitizer	No Data

443 BASE

For Product (for dust or fume)		For Components						
		Copper	Lead	Arsenic	Zinc	Nickel	Tin	Iron
Oral LD_{50}	Believed to be 1-3 g/kg, moderately toxic	3.5 mg/kg (mouse, intraperi-toneal)	No Data	763 mg/kg (rat)	No Data	> 5 g/kg (rat)	No Data	30 g/kg (rat)
Dermal LD_{50}	Believed to be > 2 g/kg	375 mg/kg (rabbit, subcutan-eous)	No Data	No Data	No Data	> 7.5 g/kg (rabbit, subcutaneous)	No Data	No Data
Inhalation LC_{50}	Believed to be Moderately Toxic	No Data	No Data	No Data	No Data	> 12 mg/kg (rat, subcutaneous)	No Data	No Data
Irritation	Eye and Respiratory irritant	Respira-tory irritant	Not irritating	No Data	Eye irritant	Respiratory irritant, skin sensitizer	No Data	Eye irritant

706/715 BASE

For Product: Dust or Fume		For Components								
		Copper	Nickel	Mang anese	Cobalt	Iron	Zinc	Aluminum	Silicon	Beryllium
Oral LD_{50}	Believed to be >5 g/kg	3.5 mg/kg (mouse Ip)	> 5 g/kg (rat)	9 g/kg (rat)	6.2 g/kg (rat)	30 g/kg (rat)	No Data	No Data	3.16 g/kg (rat)	18-200 mg/kg (rat)
Dermal LD_{50}	Believed to be >2 g/kg	375 mg/kg (rabbit, subcut)	>7.5 g/kg (rabbit, subcut)	No Data	No Data	No Data	No Data	No Data	No Data	No Data
Inhalation LC_{50}	Believed to be slight-moderate toxicity	No Data	>12 mg/kg (rat, It)	No data	165 mg/m^3 30 min (rat)	No Data	No Data	>1000 mg/m^3 (rat)	No Data	>0.8 mg/m^3 50 min (rat)
Irritant	Eye & Resp irrit.	Resp Irritant	Resp Irritant	Mild eye & skin	Resp Irritant	Eye Irritant	Eye Irrit.	Mild eye & skin irritant	Eye skin resp irrit	Irritant
Sensitizer	No Data	No Data	Skin Sens	No Data	Skin Resp	No Data	No Data	No Data	No Data	Skin Sens.

740/745/752 BASE

For Product: Dust or Fume		For Components				
		Copper	**Manganese**	**Lead**	**Zinc**	**Nickel**
Oral LD_{50}	Believed to be >5 g/kg	3.5 mg/kg (mouse, intraperitoneal)	9 g/kg (rat)	No data	No data	>5 g/kg (rat)
Dermal LD_{50}	Believed to be >2 g/kg	375 mg/kg (rabbit, subcutaneous)	No data	No data	No data	>7.5 g/kg (rabbit, subcutaneous)
Inhalation LC50	Believed to be slightly to moderately toxic	No data	No data	No data	No data	>12 mg/kg (rat, intratracheal)
Irritation	Eye and respiratory irritant	Respiratory irritant	Mild skin & eye irritant	Not irritating	Eye irritant	Respiratory irritant, skin sensitizer

Under normal handling conditions the solid alloy presents no significant health hazards. Processing of the alloy by dust or fume producing operation (grinding, buffing, heating, welding, etc.) may result in the potential for exposure to airborne metal particulates or fume. The exposure levels in Section 8 are relevant to fumes and dusts.

Effects of Overexposure:

Aluminum- Excessive exposure to aluminum fume and dust has been associated with lung disease, but this effect is probably due to simultaneous silica exposure.

Antimony- Antimony and its compounds are irritating to the skin and mucous membranes and are systemic poisons. Effects are reported to include metallic taste in the mouth, vomiting, colic, loss of appetite and weight, cardiac problems, and diarrhea. In addition, dermatitis, may result which starts as an inflammation of the hair follicles and can progress through pus formation and sloughing to leave a contracted scar.

Beryllium- Inhalation of beryllium dust or fume may result in the production of an acute or chronic systemic diseases depending upon the level exposure and the beryllium compound involved. Granulomatous lesions of the skin, liver, kidneys, spleen, and lymph nodes have been reported. These include relatively non-productive cough, progressive difficulty in breathing, loss of appetite, and loss of weight. The major difference between the two is the suddenness of onset and the rate of progression. In the acute form, the symptoms appear in several hours to several weeks after exposure and there is usually rapid progression of signs including dyspnea, anorexia, and extreme weight loss. Complete recovery is possible and fatal cases usually result from acute heart disease. In chronic beryllium disease, the symptoms or signs are generally delayed in their onset and are persistent in nature. They may be triggered or aggravated by stresses such as pregnancy, respiratory infection, and thyrotoxicosis. In the progression of the disease, symptoms of heart disease may occur. Damage to the lungs may be in both the acute and chronic forms, both of which . have similar signs and symptoms. Beryllium is also a suspected human carcinogen and has caused cancer in laboratory animals.

Cadmium- Inhalation of cadmium fumes may cause respiratory irritation with a sore, dry throat and a metallic taste followed by a cough, chest pain, and difficulty in breathing. Bronchitis, pneumonitis, and pulmonary edema have been reported as a result of the irritation of the fumes. Headaches, dizziness, loss of appetite, and weight loss have also been reported and the liver, kidneys and bone marrow may be injured by the presence of the metal. Continued exposure to lower levels of cadmium has resulted in chronic poisoning characterized by irreversible lung damage and kidney damage. A single, high level exposure to cadmium can cause severe lung irritation which may be fatal. Cadmium is also a suspected. human carcinogen.

Chromium- In some workers, chromium compounds act as allergens and may cause dermatitis and may also produce pulmonary sensitization. Chromic acid and chromates have a direct corrosive effect on the skin and mucous membranes of the upper respiratory tract. Although rare, there may be the possibility of skin and pulmonary sensitization. IARC has determined that there is sufficient evidence of increased lung cancer among workers in the chromate-producing industry and possible chromium alloy workers. This determination is supported by sufficient evidence for carcinogenicity to animals and possible mutagenicity testing of Cr VI compounds.

Cobalt- Cobalt has been reported as causing hyper sensitization type dermatitis in individuals who are susceptible. Animal studies have shown that particulate cobalt is an acutely irritating substance and industrial exposures, possibly combined with small amounts of silica, are reported capable of producing serious pneumoconiosis which is initially of an insidious nature.

Copper - Melting, grinding, cutting of copper may produce fumes or dust exposure and breathing these fumes or dust may present potentially significant health hazards. Fumes of copper may cause metal fume fever with flu-like symptoms and skin and hair discoloration. While industrial dermatitis has not been reported, keratinization of the hands and the soles of the feet has been reported. Systemically as well, copper dust and fumes cause irritation of the upper respiratory tract, metallic taste in the mouth, and nausea.

Iron - The inhalation of iron oxide fumes or dust may cause an apparent benign pneumoconiosis which is called siderosis. This disease is reported to be disabling, but makes x-ray diagnosis of other lung conditions difficult or impossible.

Lead- **Short term exposure:** Lead is an accumulative poison. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include decreased physical fitness, fatigue, sleep disturbance, headache aching bones and muscles, constipation abdominal pains, and decreasing appetite. The effects are reversible and complete recovery is possible. Inhalation of large amounts of lead may lead to seizures, coma and death.

Lead- **Long term exposure:** Long term exposure can result in a buildup of lead in the body and more severe symptoms. These include anemia, pale skin, a blue line at the gum margin, decreased hand grip strength, abdominal pain, severe constipation, nausea, vomiting and paralysis of the wrist joint. Prolonged exposure may also result in kidney damage. If the nervous system is effected, usually due to very high exposure, the resulting effects include severe headache, convulsions, coma, delirium, and death. Alcohol ingestion and physical exertion may bring on symptoms. Continued exposure can result in decreased fertility and/or increased chances of miscarriage or birth defects.

Manganese- Chronic manganese poisoning may result from inhalation of dust or fume. The central nervous system is the chief site of the injury, and there also may be adverse blood and kidney effects. Chronic manganese poisoning is not a fatal disease although it is extremely disabling. Some individuals may be hyper susceptible to manganese. Freshly formed manganese fume has caused fever and chills similar to metal fume fever.

Nickel- The most common ailment arising from contact with nickel or its compounds is an allergic dermatitis known as "nickel itch" which usually occurs when the skin is moist. Generally nickel and most salts of nickel do not cause systemic poisoning, but nickel has been identified as a suspected carcinogen. There can also be adverse effects to the lungs and nasal cavities.

Silicon- Accumulation in lungs may be responsible for benign pneumoconiosis, but is not considered to be responsible for pulmonary functional impairment or respiratory symptoms.

Tin- The inhalation of inorganic tin fumes or dust may cause an apparent benign pneumoconiosis called stannosis which is reported to be disabling.

Zinc-(as oxide)- Zinc is very low in toxicity but inhalation of fumes may cause "metal fume fever." Onset of symptoms may be delayed 4-12 hours and include irritation of the nose, mouth and throat, cough, stomach pain, headache, nausea, vomiting, metallic taste, chills, fever, pain in the muscles and joints, thirst, bronchitis or pneumonia and a bluish tint to the skin. These symptoms go away in 24-48 hours and leave not effect.

NOTE: **Antimony trioxide, beryllium, cadmium, chromium, cobalt-chromium alloy, lead and nickel have been identified as potential human carcinogens.**

SUBCHRONIC/CHRONIC EXPOSURE: No information for products, Sub chronic and chronic exposure to beryllium via inhalation has caused lung damage in laboratory animals.

CARCINOGENICITY: In laboratory animal studies, chronic exposure to high concentrations of nickel has caused an increase in lung nasal tumors. The International Agency for Research on Cancer (IARC) has classified nickel, cobalt and cobalt compounds as possibly carcinogenic to humans, Group 2B. Chronic exposure to beryllium has produced lung cancer in several species of lab animals. Beryllium is listed as a known human carcinogen by IARC (group1) OSHA, NTP, and EPA.

MUTAGENICITY: This product is known or reported to be mutagenic. Nickel has been shown to be mutagenic in *in vitro* bacterial and mammalian systems.

SECTION 12. ECOLOGICAL INFORMATION

ECOTOXICITY: No data available on these products. Individual constituents are as follows:

Copper: The toxicity of copper to aquatic organisms varies significantly not only with the species, but also with the physical and chemical characteristics of the water, such as its temperature, hardness, turbidity and carbon dioxide content. Copper concentrations varying from 0.1 to 1.0 mg/1have been found by various investigators to be not toxic for most fish. However, concentrations of 0.015-3.0 mg/1 have been reported as toxic, to fish particularly in soft water and to many kinds of fish, crustaceans, mollusks, insects and plankton.

Lead: LC_{50} (48 hrs.) to bluegill, is reported to 2-5 mg/1. Lead is toxic to waterfowl.

Arsenic: *Daphnia* magna, 48 hr. LC_{50} = 3.8 mg/L; Fathead minnow, 96 hr. LC_{50} = 9.9 mg/L

Nickel: 96 hr. LC_{50}, rainbow trout = 31.7 mg/L; 96 hr. LC_{50}, fathead minnow = 3.1 mg/L; 72 hr. EC_{50}, freshwater algae (4 species) : = 0.1 mg/L; 96 hr. LC_{50}, *Daphnia* = 0.51 mg/L

Mobility: Dissolved lead may migrate through soil.

Persistence/Degradability: Lead may persist and accumulate in the environment, not biodegradable. Arsenic may cause long-term effects in the environment.

BIOACCUMULATION: No Data

SECTION 13. DISPOSAL CONSIDERATIONS

Waste Disposal Method: Dispose of in accordance with federal, state and local regulations. Cleanup personnel should wear respirators and protective clothing. Ventilate area of release.

SECTION 14. TRANSPORT INFORMATION

	U.S. DOT	RID/ADR	IMDG	IATA	IMO	CANADA TDG
PROPER SHIPPING NAME:						
HAZARD CLASS:				**NOT REGULATED**		
UC NO:						
PACKING GROUP:						
LABEL:						
REPORTABLE QUANTITY:						

SECTION 15. REGULATORY INFORMATION

US FEDERAL

TSCA	The components of this product are listed on the Toxic Substance Control Act inventory.
CERCLA:	Copper, R.Q.=5000 lbs.; Nickel, R.Q.= 100 lbs.; Zinc, R.Q.= 1000 lbs.; Lead, R.Q.= 10 lbs.; Arsenic, R.Q.= 1 lb. (No reporting is required if diameter of the pieces of metal is equal to exceeds 100 micrometers(0.004 inches)
SARA 313:	Copper, Zinc, Nickel, Cobalt (fume or dust) Lead, Arsenic, Manganese

SARA 313	*Health:*	Acute-Yes	*Fire:*	*Reactivity:*	*Release of Pressure*
Hazard Class:	For dust or fume only	Chronic-Yes	None	None	None
SARA 302 EHS List:	None of the components of these products are listed.				

*R.Q.= Reportable Quantity

STATE RIGHT-TO-KNOW STATUS

Component	*CA Prop 65	New Jersey	Pennsylvania	Massachusetts	Michigan
Copper	Not Listed	X	X	X	X
Nickel	X	X	X	X	X
Lead	X	X	X	X	X
Zinc	Not Listed	X	Not Listed	X	X
Manganese	Not Listed	X	X	X	Not Listed
Tin	Not Listed	Not Listed	X	X	Not Listed
Cobalt	X	X	X	X	X
Iron	Not Listed	Not Listed	Not Listed	Not listed	Not Listed
Arsenic	X	X	X	X	X

* "WARNING: These products contain detectable amounts of a chemical(s) known to the State of California to cause cancer and/or birth defects or other reproductive harm."

EUROPEAN REGULATIONS

Because these materials contains Lead at >1%, these materials are classified as **T, Toxic,** because these materials contain arsenic at 0.1% these materials are classified as **T, Toxic,** because these materials contain nickel at >0.1%, and cobalt at >0.2%, these materials are classified as **Xn, Harmful.** Because these materials contain lead at >0.2% these materials are classified as **Xn, Harmful.**
However, these materials in their massive solid form are not required to be labeled under EC regulations.

GERMAN WGK CLASSIFICATION: Unknown

CANADIAN REGULATIONS

DSL LIST: The components of this product are on the DSL or are exempt from reporting under the New Substance Notification Regulations.
IDL: Lead, Copper, Nickel, Tin, Arsenic, Manganese, Cobalt
WHMIS: These products are considered to be manufactured articles and therefore are not subject to WHIMS requirements.

SECTION 16. OTHER INFORMATION

IMPORTANT

LIABILITY DISCLAIMER

The information contained in this Material Safety Data Sheet (MSDS) is believed to be correct as it was obtained from sources we believe are reliable, including: "Threshold Limit Values & Biological Exposure Indices for 1988-89" (American Conference of Government & Industrial Hygienists), Air Contaminates--Permissible Exposure Limits (Title 29, Code of Federal Regulations, part 1910.1000--OSHA) and OSHA (Cleveland Area Office) letter of 6/15/89. However, no representations, guarantees or warranties of any kind are made as to its accuracy, suitability for particular applications, hazards connected with the use of the material, or the results to be obtained from the use thereof. User assumes all risks and liability of any use, processing or handling of any material, variations in methods, conditions and equipment used to store, handle or process the material and hazards connected with the use of the material are solely the responsibility of the user and remain at his/her sole discretion.

Compliance with all applicable federal, state, and local laws and regulations remains the responsibility of the user, and the user has the responsibility to provide a safe work place, to examine all aspects of its operation and to determine if or where precautions, in addition to those described herein, are required.

Note: The copper and copper alloy products are in solid form and will not result in an environmental exposure in such form. We cannot anticipate all the processes or applications to which this product might be subjected or which might create exposures. The information supplied has been furnished by our suppliers and consequently, our company assumes no responsibility for the accuracy or completeness of the data contained herein.

PREPARED BY: H&H Tube
DATE: 04/02/13
REVIEWED/REV 03/01/18

SAFETY DATA SHEET

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SECTION I. MATERIAL IDENTIFICATION

Stainless Steel: Chemical Name & Synonyms: 304,316,347,321,310,317,304L,316L,317L,2205

SECTION 2. HAZARD(S) IDENTIFICATION (dust/fume only)

Classification: Stainless Steel / Stainless Steel Alloys: **Dust and Fumes Only**
Non-hazardous in solid form

Pictogram:

Signal Word: **WARNING**

Hazard Statement: Irritating to respiratory tract, lungs, mucous membranes, and eyes
Toxic if fumes are inhaled- suspected carcinogen
Chronic exposure to dust/fumes may cause "metal fume fever"

Precautionary Statement:

Prevention: Wear appropriate gloves for task, use local exhaust, if fumes not maintained below legal limit use appropriate respirator. Safety glasses to prevent eye irritation from dust.

Response: Eyes- flush particles from eyeballs with clean water if irritation persists seek medical attention
Skin- wash with soap and water, if rash develops seek medical attention
Inhalation- remove from exposure, respiratory irritation persists seek medical attention

Storage: Store away from incompatible materials and keep dust away from source of ignition

Disposal: Dispose of in accordance with federal, state and local regulations. Clean up personnel should wear respirators and protective clothing. Ventilate area of release.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Base Metal Alloys	CAS#	% wt.	CAS#	% wt.
Iron	1309-37-1	50-82	Columbium	1.0 max
Manganese	7439-96-5	13.5max	Copper	0.75 max
Phosphorus	7723-14-0	0.05 max	Aluminum	1.5 max
Sulfur	7704-34-9	0.04 max	Titanium	2.5 max
Silicon	7740-21-3	2.5 max	Molybdenum	0-5
Chromium	7740-47-3	10-30 max	Cobalt	0-1.0
Nickel	7740-02-0	34 max	Carbon	.08 max

SECTION 4. FIRST-AID MEASURES (dust /fume only)

Eye Contact: Flush particles from eyeballs with clean water for at least 15 minutes. If irritation persists, seek medical attention.

Skin Contact: Wash skin with soap and water to remove any metallic particles. If a rash develops, seek medical attention.

Inhalation: Remove from exposure. If severe respiratory irritation persists, seek medical attention. Excessive inhalation of some metal fumes can produce an acute reaction known as "Metal Fume Fever", with symptoms of chills and fever similar to flu symptoms. These symptoms appear within a few hours of exposure; however, long term effects have not been noted from isolated instances of excessive exposure.

SECTION 5. FIRE-FIGHTING MEASURES

Flash Point: NA
LEL: NA
UEL: NA
Extinguishing Media: NA
Special Fire Fighting Precautions: NA

Stainless steel products in their solid state present no fire or explosion hazard. Moderate hazard exists when they are in the form of dust particulates and exposed to heat, flames, chemical action or in contact with strong oxidizers.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Steps to be taken in Case Material is Released or Spilled:

No special precautions are necessary for spills of bulk material. If large quantities of dust are spilled, remove by vacuuming or wet sweeping to prevent heavy concentration of airborne dust. If liquids (acids or bases) containing solubilized metal are spilled evacuate unprotected personnel from area. Absorb liquid by means of vermiculite, dry sand or similar material. Follow federal, state, and local regulations concerning the disposal of waste.

SECTION 7. HANDLING & STORAGE

Store materials away from incompatible materials and keep dust away from sources of ignition.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Stainless Steel Alloys:	CAS#	Permissible Exposure Limits	
Iron	1309-37-1	Iron Oxide Fume	10 mg/M^3
Manganese	7439-96-5	(c) as Manganese	5 mg/M^3
Phosphorous	7723-14-0	Phosphorous (Yellow)	0.1 mg/M^3
Sulphur	7704-34-9	Sulfur Dioxide	13 mg/M^3
Silicon	7740-21-3	None Listed	
Chromium	7740-47-3	Soluble Chromic/Salts	0.5 mg/M^3
		Chrome & Insoluble Salts	1 mg/M^3
Nickel	7740-02-0	Nickel	1 mg/M^3
Columbium	7440-25-7	Total Dust	15 mg/M^3
Copper	7440-50-8	Copper	0.2 mg/M^3
Aluminum	7429-90-5	None Listed	
Titanium	7440-32-6	None Listed	
Molybdenum`	7439-98-7	as Mo	5.0 mg/M^3
		Insoluble Mo	15.0 mg/M^3
Cobalt	7440-48-4	Cobalt	0.1 mg/M^3
Carbon	7440-44-0	Not Available	

Personal Protection:

Gloves: Suitable for protection against physical injury

Eye: Safety glasses or goggles when there is a probability of flying particles

Respiratory: When engineering or administrative controls cannot maintain exposures below permissible limits during welding, brazing, machining, and other processes which may generate airborne contaminants, use appropriate NIOSH/MSHA approved respirator.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Form:	**Solid**	Evaporation Rate	NA
Vapor Pressure:	NA	Auto Ignition Rate	NA
Solubility in Water:	NA	Appearance & Odor	Gray-Black & Odorless
Specific Gravity:	7	Physical State:	Solid
% Volatile by Volume:	NA	Boiling Point	NA

SECTION 10. STABILITY & REACTIVITY

Chemical Stability				
If no, under which conditions	Yes	X	No	Chemically stable in its solid form
Incompatibility with other substances if so, which ones?	Yes	X	No	Strong Acids, Bases, and Chemical Oxidizers
Reactivity, and under what conditions				Will react with strong acids to liberate flammable hydrogen gas.
Hazardous Decomposition Products				Hydrogen Gas

SECTION 11. TOXICOLOGICAL INFORMATION

Hazardous Ingredient		LD_{50} Ingredient Species/Route	LC_{50} Ingredient Species/Rte.	Hazardous Ingredient	LD_{50} Ingredient Species/Rte.	LC_{50} Ingredient Species/Rte.
Iron		Not available	NA	Cobalt	Not Avail.	Not Avail.
Manganese	(oral)	9,000mg/kg rat	NA	Carbon	Not Avail.	Not Avail.
Phosphorous		Not available	NA	Molybdenum	Not Avail.	Not Avail.
Sulphur		Not available	NA	Copper	Not Avail.	Not Avail.
Silicon	(oral)	3,160mg/kg rat	NA	Aluminum	Not Avail.	Not Avail.
Chromium		Not available	NA	Titanium	Not Avail.	Not Avail.
Nickel		Not available	NA			
Columbium		Not available	NA			

Under normal handling conditions the solid alloy presents no significant health hazards. Processing of the alloy by dust or fume producing operation (grinding, buffing, heating, welding, etc.) may result in the potential for exposure to airborne metal particulates or fume. The exposure limits in Section 8 are relevant to fumes and dust.

Effects of Overexposure:

Acute: exposure to high concentrations of metallic fumes or dusts may result in irritation and/or sensitization of the respiratory tract, lungs, mucous membranes, and eyes. Excessive inhalation of fumes from many metals can produce an acute reaction known as "metal fume fever". Dermatitis.

Chronic: siderosis, bronchitis, pneumonitis, inflammation and/or ulceration of upper respiratory tract. Kidney or liver damage. Various forms of dermatitis. Inflammation of the joints.

Signs and Symptoms of Overexposure: redness, swelling, itching of skin and eyes. Coughing, wheezing, shortness of breath, decreased pulmonary function. Metal fume fever: chills and fever, a metallic taste in the mouth, dryness and irritation of the throat, sleepiness, lower back pain, and edema, loss of appetite, jaundice.

NOTE: Chromium and nickel have been identified by the International Agency for Research on Cancer (IARC) and the National Toxicology Program (NTP) as potential carcinogens.

SECTION 12. ECOLOGICAL INFORMATION

Not applicable for solid 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, plant 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 solid 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 not be compliant with a POTW permit or other regulations.

SECTION 13. DISPOSAL CONSIDERATIONS

Product 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 40CFR 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.

SECTION 14. TRANSPORT INFORMATION

Hazardous Materials Description/Proper Shipping Name:

Not applicable for solid formed alloy product

Hazard Class:

Not applicable for solid formed alloy product

Identification Number:

Not applicable for solid formed alloy product

SECTION 15. REGULATORY INFORMATION

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.

California Proposition 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.

SECTION 16. OTHER INFORMATION

IMPORTANT

LIABILITY DISCLAIMER

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Note: The stainless steel alloy products are in solid form and will not result in an environmental exposure in such form. We cannot anticipate all the processes or applications to which this product might be subjected or which might create exposures. The information supplied has been furnished by our suppliers and consequently, our company assumes no responsibility for the accuracy or completeness of the data contained herein.

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