

Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)		Oct 08
Supplier A. D. Bird Stainless Ltd	Address Box Mill Sheffield Road Penistone S36 6HQ	Tel 01226 766766 Fax 01226 766841
Description REACH is a new system for controlling chemicals in Europe. It became law on 1 st June 2008.		
REACH Elements. REACH places greater responsibility on industry to manage the risk of chemicals in use and to provide appropriate safety information. It covers most chemicals that are manufactured in or imported into the EU.		The chemicals can be: A substance on its own A substance in a Preparation A substance in an Article
It is the duty of A.D.Bird Stainless Ltd to decide if we are dealing with an Article (where shape, surface, or design is most important) or a substance/preparation (where chemical composition is most important).		Stainless Steel Bars: Are produced with a certain shape or size which can be engineered into another object which will itself be an Article
In a general sense an Article can also usually be considered a finished product		
A. D. Bird Stainless are importers of Articles: We class Stainless Steel Bars as Articles		
REACH Registration. Registration is required when importing an Article and that the substances contained in the Article are intended to be released under normal or reasonably foreseeable conditions of use. Or that the Article contains a 'Substance of Very High Concern' (SVHC) as defined on the 'Candidate List' to be published in 2009.		
REACH Guidance. The guidance is clear that only substances that are intentionally released from articles should be considered for registration and that Stainless Steel does not contain any SVHCs. Comments We qualify our statements, based upon the information supplied by UK REACH Competent Authority Information leaflets as supplied by HSE UK		
http://www.hse.gov.uk/reach		

A.D.Bird Stainless and REACH Registration.

We are not required to submit a registration to the European Chemicals Agency for the Substances contained within the Articles we import from outside the EU, as we are importing an Article where shape, surface, or design is most important and as such will be engineered into another object which itself will be an article. That the substances contained in the Article, imported, are NOT intended to be released under normal or reasonably foreseeable conditions of use and that the Article does NOT contain a 'Substance of Very High Concern' (SVHC) as defined on the 'Candidate List' to be published in 2009.

Safety Data Sheets.

For information we supply a Safety Data Sheet for Stainless Steel which provides information on the composition/information on ingredients contained in Stainless Steel and outlines the possible hazards and risks of the products. It also contains general information pertaining to all aspects of stainless steel and its ingredients.

Attachments

A.D.Bird Stainless Ltd Stainless Data Sheet

Date: 10 Oct 2008

A.D. Bird Stainless Ltd

STAINLESS DATA SHEET

1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: STAINLESS STEEL LONG PRODUCT
SDS CATEGORY: All Grades
DISTRIBUTER: A. D. Bird Stainless LTD

DESCRIPTION: Solid product, various forms and uses
INFO. PHONE: 10226 766766

DATE OF APPROVAL: 08/2008

2 - COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT	CAS NUMBER	PERCENTAGE BY WEIGHT	OSHA PEL	ACGIH TLV
Iron 7439-89-6 Nickel	7440-02-0	Balance 0 - 46	10 mg/m ³ , Iron Oxide, fume 1 mg/m ³ , metal and insoluble compounds	5 mg/m ³ Iron Oxide, dust and fume 1.5 mg/m ³ , metal 0.1 mg/m ³ , soluble compounds 0.2 mg/m ³ , insoluble compounds
Chromium	7440-47-3	10 - 30	1 mg/m ³ , metal and insoluble salts 0.5 mg/m ³ , Cr ^(VI) compounds AL-2.5 µg/m ³ / PEL-5.0 µg/m ³ (as Cr ^(VI))*	0.5 mg/m ³ , metal and Cr ^(VI) compounds 0.05 mg/m ³ , Cr ^(VI) water soluble compounds 0.01 mg/m ³ , Cr ^(VI) insoluble compounds
Molybdenum	7439-98-7	0 - 2.0	5 mg/m ³ , soluble Mo compounds (as Mo) 15 mg/m ³ , insoluble Mo compounds, total dust (as Mo)	5 mg/m ³ , soluble Mo compounds (as Mo) 10 mg/m ³ , insoluble Mo compounds (as Mo)
Copper	7440-50-8	0 - 4.0	0.1 mg/m ³ , fume (as Cu) 1 mg/m ³ , dust and mist (as Cu)	0.2 mg/m ³ , fume (as Cu) 1 mg/m ³ , dusts and mists (as Cu)
Manganese	7439-96-5	0 - 1.0	5 mg/m ³ Coiling, Mn compounds and Mn fume (as Mn)	0.2 mg/m ³ , elemental and inorganic compounds (as Mn)
Silicon	7440-21-3	0 - 6.5	15 mg/m ³ , total dust 5 mg/m ³ , respirable fraction	10 mg/m ³ , total dust
Neubium	7440-03-1	0 - 1.0	1.5 mg/m ³ , total dust (PNOR) 5 mg/m ³ , respirable fraction (PNOR) (not regulated)	10 mg/m ³ , total dust (PNOR) (not classified)
Aluminum	7429-90-5	0 - 4.0	15 mg/m ³ , metal, total dust (as Al) 5 mg/m ³ , metal, respirable fraction (as Al)	10 mg/m ³ , metal dust 5 mg/m ³ , welding fume
Vanadium	7440-62-2	0 - 1.1	0.5 mg/m ³ Coiling, Vanadium Pentoxide, respirable dust 0.1 mg/m ³ Coiling, Vanadium Pentoxide, respirable fume	0.05 mg/m ³ , Vanadium Pentoxide, respirable dust and fume
Tungsten	7440-33-7	0 - 2.5	15 mg/m ³ , total dust (PNOR) 5 mg/m ³ , 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	7440-25-2	0 - 1.0	5 mg/m ³ , metal and oxide dust (as Ta)	5 mg/m ³ , metal and oxide dust (as Ta)
Titanium	7440-32-6	0 - 2.4	15 mg/m ³ , Titanium Dioxide, total dust	10 mg/m ³ , Titanium Dioxide, total dust

Products: STAINLESS STEEL.
SSDS Category: Stainless Steel

NOTE: 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: Arsenic, Boron, Cadmium, Calcium, Cobalt, 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.

3 - HAZARDS IDENTIFICATION

GENERAL HAZARD STATEMENT : Solid metallic products distributed by A.D. Bird Stainless re 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 processing conditions such as burning, melting, cutting, sawing, brazing, grinding, milling, machining.

Certain materials and equipment utilized in processing of steel products (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 or 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 concentrations 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.

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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 product as a whole has not been tested.
- Individual components and some compounds of these elemental metals have been associated with carcinogenicity by NTP and IARC.
- No component greater than 0.1% by weight within this solid product is regulated by OSHA within 29 CFR 1910 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 consist of 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.

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.

5 - FIRE FIGHTING MEASURES

FLASH POINT (Method Used): N/A

AUTOIGNITION TEMPERATURE : N/A

FLAMMABILITY CLASSIFICATION : N/A

FLAMMABLE LIMITS : N/A

GENERAL FIRE HAZARD : None for solid formed product

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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 particulates 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.

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 fires, 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 cleanup, 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 cleanup 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 reporting of spills and waste disposal.

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 steel product.

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, for PELs and TLVs) 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 installed, 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.

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

EYE: 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.

9 - PHYSICAL AND CHEMICAL PROPERTIES

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

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

Vapor Density (AIR = 1): N/A

Melting Point: 2500-2800 °F

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

Specific Gravity (H₂O = 1): 7 - 9

Evaporation Rate: N/A

Solubility in water: Insoluble

pH: N/A

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 particulates 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

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 a 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; LD50 (oral) - NIF.

Carcinogenicity - Nickel: 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 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 upon its oxidation state or valence. 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 particulates were 7µm or less in size, revealed no chromium-related effects in the lungs or alveolar macrophage structure or function. Chromium was observed to be readily phagocytosed by alveolar macrophages. LD50 (oral) - NIF; LC50 - NIF.

Carcinogenicity - Chromium: 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).

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Molybdenum: Based on animal experiments, molybdenum and its compounds are highly toxic. Some evidence of liver dysfunction with hyperbilirubinemia have 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 g/kg; LC50 - NIF; TCLo - 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) - 3 160 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 fumes 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 25 ppm in the diet show early signs of poisoning. Vanadium Pentoxide dust at concentrations of 70 mg/m³ is fatal to animals within a few hours. One study of Vanadium Pentoxide to five human volunteers found severe upper respiratory tract irritation in the form of persistent productive cough and increased mucus. 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.

Aluminium: 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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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 product 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 groundwater based upon its insoluble form, however, finely divided material can become mobile in water and contaminate soil and groundwater. 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 or contaminate sewage sludge, may interfere with the treatment system process, and may be non-compliant with a POTW permit or other regulations.

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.

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.

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, Cobalt and Chromium are subject to reporting requirements (Aluminum (qualified as fume or dust), Manganese and Copper are less than the 1% minimum 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), Tantalum are listed. E - environmental hazard, S - special hazardous substance.

NEW JERSEY R-T-K ENVIRONMENTAL HAZARDOUS SUBSTANCE LIST : Listed components - Aluminum (as dust and fume), Chromium, Copper, Cobalt, Manganese, and Nickel.

CALIFORNIA PROPOSITION 65 : Listed possible trace (much 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.