



# MATERIAL SAFETY DATA SHEET

## 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT(S): STEEL - A50, 301, 301L, 302, 302B, 304, 304H, 304L, 304LN, 305, 316, 316L, 316LN, 316TI, 317, 317L, 317X, 317LXN, 317XN, 321, 321H, 347, 348, 370, 388 Zr-Co<sup>TM</sup>, A610, A611, 850, 13-8 PH, 307  
 MSDS CATEGORY: 1-B  
 MANUFACTURER: ALLEGHENY LUDLUM CORPORATION  
 100 RIVER ROAD  
 BRACKENRIDGE, PA 15014  
 DATE OF APPROVAL: 09-15-2004  
 CHEMTRAC: 800-424-9300  
 INFO. PHONE: 724-226-5980 (M-F, 9 a.m.-4:30 p.m. EST)  
 EMERGENCY PHONE: 724-226-5555  
 DESCRIPTION: Solid product, various forms and uses

## 2 - COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT	CAS NUMBER	PERCENTAGE BY WEIGHT	OSHA PEL	ACGIH TLV
Iron	7439-89-6	52 - 78	10 mg/m <sup>3</sup> , Iron Oxide form, fume	5 mg/m <sup>3</sup> , Iron Oxide form, dust and fume
Chromium	7440-47-3	12 - 24	1 mg/m <sup>3</sup> , metal and insoluble salts	0.5 mg/m <sup>3</sup> , metal and Cr (III) compounds 0.05 mg/m <sup>3</sup> , Cr (VI) water soluble compounds 0.01 mg/m <sup>3</sup> , Cr (VI) water insoluble compounds
Nickel	7440-02-0	6.0 - 19	1 mg/m <sup>3</sup> , metal and insoluble compounds	1 mg/m <sup>3</sup> , metal compounds 0.1 mg/m <sup>3</sup> , insoluble compounds 0.2 mg/m <sup>3</sup> , soluble compounds
Molybdenum	7439-98-7	0 - 5.0	5 mg/m <sup>3</sup> , soluble Mo compounds (as Mo)	5 mg/m <sup>3</sup> , soluble Mo compounds (as Mo) 10 mg/m <sup>3</sup> , insoluble Mo compounds (as Mo)
Silicon	7440-21-3	0 - 6	15 mg/m <sup>3</sup> , total dust	10 mg/m <sup>3</sup> , total dust
Manganese	7439-96-5	0 - 2.0	5 mg/m <sup>3</sup> , respirable fraction	0.2 mg/m <sup>3</sup> , elemental and inorganic compounds (as Mn)
Tungsten	7440-33-7	0 - 1.8	15 mg/m <sup>3</sup> , total dust (PNOR)	1 mg/m <sup>3</sup> , 3 mg/m <sup>3</sup> STEL, soluble W compounds (as W) 5 mg/m <sup>3</sup> , 10 mg/m <sup>3</sup> STEL, insoluble W compounds (as W)
Aluminum	7429-90-5	0 - 1.5	15 mg/m <sup>3</sup> , metal, total dust (as Al)	10 mg/m <sup>3</sup> , metal dust 5 mg/m <sup>3</sup> , welding fume
Columbium	7440-03-1	0 - 1.0	5 mg/m <sup>3</sup> , metal, respirable fraction (as Al)	10 mg/m <sup>3</sup> , total dust (PNOR) (not classified)
Titanium	7440-32-6	0 - 0.7	15 mg/m <sup>3</sup> , Titanium Dioxide form, total dust	10 mg/m <sup>3</sup> , Titanium Dioxide form, total dust
Copper	7440-50-8	0 - 0.75	0.1 mg/m <sup>3</sup> , fume (as Cu)	0.2 mg/m <sup>3</sup> , fume (as Cu) 1 mg/m <sup>3</sup> , dust and mist (as Cu)
Cobalt	7440-48-4	0 - 1.0	0.1 mg/m <sup>3</sup> , metal, dust, and fume (as Co)	0.02 mg/m <sup>3</sup> , elemental and inorganic compounds (as Co)

NOTE: 1) All exposure limits are 8-hour TWA 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, Phosphorus, Nitrogen, Aluminum, Arsenic, Boron, Cadmium, Calcium, Lead, Tin, Titanium, Vanadium, and Zirconium. Abbreviations and acronyms are defined in Section 16.





Handwritten initials/signature

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 flames, 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 CONTROL/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 CONTROL/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 insulated, 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. 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: 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: NIF for steel product (Fe-2797/Cr-3452/Ni-2651 °F)  
Appearance and Odor: Silver-gray metallic solid form, odorless  
Specific Gravity (H<sub>2</sub>O = 1): 7 -  
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.



**Tungsten:** Tungsten has been shown to act by antagonizing the action of the essential trace element Molybdenum. Tungsten metal powder administered to animals in several studies as not locally 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/m<sup>3</sup>). 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 (intrapleural) - 5 g/kg rat; LC50 - NIF.

**Columbium:** Intraferes with calcium as an activator of enzyme systems. 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.

**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/m<sup>3</sup>. LD50 (oral) - NIF; LC50 - NIF.  
**Cobalt:** Cobalt dust may cause an asthma-like disease with symptoms ranging from cough, shortness of breath and dyspnea to decreased pulmonary function, nodular fibrosis, permanent disability, and death. Exposure to cobalt may cause weight loss, dermatitis, and respiratory hypersensitivity. LD50 (oral rat) - 6171 mg/kg; LC50 - NIF.

**Carcinogenicity - IARC:** has listed cobalt and cobalt compounds within group 2B (agents which are possibly carcinogenic to humans). ACGIH has placed cobalt and inorganic compounds in category A3 (Experimental animal carcinogen - the agent is carcinogenic in experimental animals at a relatively high dose, by route(s), histologic type(s), or by mechanism(s) that are not considered relevant to worker exposure. Cobalt has been classified by the Federal Republic of Germany to be carcinogenic to experimental animals.

### 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; POTW may pass-through or condensate 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 restrictive 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.

MRR CONTACT: M.R. Shiry (724-226-5980)	
REVISION NO.: 11	APPROVAL DATE: September 15, 2004
SUPERSEDES MSDS DATID: September 15, 2002	

PREPARED BY: AM Health and Safety, Inc. (acting consultant)  
 This information is not intended to serve as a complete regulatory compliance document. This information is offered as a guide to the MSDS user. No guarantees can be made whether the user will be in complete or correct compliance with all applicable regulations when this MSDS is used. It is the user's responsibility to comply with all federal, state, and local regulations.

**DISCLAIMER:** All information, recommendations, and suggestions appearing herein concerning the product are based upon data believed to be reliable. It is the user's responsibility to determine the safety, toxicity, and suitability for their own use of the product described herein. Since the actual use by others is beyond our control, no guarantee, expressed or implied is made by AM Health and Safety, Inc. (AMHS&S-acting consultant) and Allegheny Ludlum as to the effects of such use, the results to be obtained, or the safety and toxicity of the product, nor does AMHS&S or Allegheny Ludlum assume any liability arising out of use by others of the product referred to herein. AMHS&S and Allegheny Ludlum shall not in any event be liable for special, incidental or consequential damages in connection with the MSDS. This MSDS is not intended as a license to operate under, or recommendation to infringe on, any patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

NOTE: The percent composition in Section 2 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 2.

**ABBREVIATIONS/ACRONYMS:**

ACGIH - American Conference of Governmental Industrial Hygienists	NIR - 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 - Certification Agency for Research on Cancer	OSHA - Occupational Safety and Health Administration
EST - Eastern Standard Time	REL - Permissible Exposure Limit
HMS - Hazardous Materials Identification System	PNOR - Particulate Not Otherwise Regulated
IARC - International Agency for Research on Cancer	PNOC - Particulate Not Otherwise Classified
mg/m <sup>3</sup> - milligram per cubic meter of air	POTW - Publicly Owned Treatment Works
ppm - million particles per cubic foot	PPE - Personal Protective Equipment
MSDS - Material Safety Data Sheet	ppm - parts per million
MSHA - Mine Safety and Health Administration	SCBA - Self-contained Breathing Apparatus
N/A - Not Applicable	STEL - Short-term Exposure Limit
NFPA - National Fire Protection Association	TLV - Threshold Limit Value

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

**16 - OTHER 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.

SARA TITLE III SECTION 313 REPORTABLE SUBSTANCES: Nickel, Chromium, Cobalt, Aluminum (fume or dust), and Manganese are subject to reporting requirements (Copper is less than the 1% de minimis 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 (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.

**15 - REGULATORY INFORMATION**

Product: STEEL - A50, 301, 301L, 302, 302B, 304, 304L, 304LN, 304N, 305, 316, 316L, 316LN, 316LT, 317, 317L, 317LN, 317LN, 321, 321H, 347, 348, 370, 388 2E Cor.™ A618, A618, 13-8 PH MSDS Category: L-B Approval Dates 9-15-2004 Page 7 of 8