



MATERIAL SAFETY DATA SHEET

Stainless Steel

DATE OF PREPARATION: October 1, 1985
Revised October 7, 2005, Revision 3

SECTION 1 – CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT/CHEMICAL NAME Stainless Steel

MANUFACTURER'S NAME & TELEPHONE # AK STEEL CORPORATION
513 425-5000 (Information)
800 422-4422 (Customer Service)
513 425-3815 (Health & Safety)

ADDRESS 703 CURTIS STREET
MIDDLETOWN, OHIO 45043-0001

SECTION 2 – COMPOSITION / INFORMATION ON INGREDIENTS

Components	CASRN ¹	% Weight	OSHA PEL ²	ACGIH TLV ³
Base Metal				
Iron	7439-89-6 as Fe	48-89	10 mg/m ³ - Iron Oxide (Fe ₂ O ₃) Dust and Fume (as Fe)	6 mg/m ³ -Iron Oxide (Fe ₂ O ₃) Dust & Fume as Fe
Alloying Metals				
Aluminum	7429-90-5 as Al	0-2	15 mg/m ³ -Total Dust 5 mg/m ³ - Respirable ⁴ as Al	10 mg/m ³ -Metal Dust 5 mg/m ³ -Welding Fume as Al
Chromium	7440-47-3 as Cr	10-27	1 mg/m ³ - Chromium Metal	0.5 mg/m ³ - Cr Metal & Cr III Compounds
Cobalt	7440-48-4 as Co	0-5	0.1 mg/m ³ - Metal and Fume as Co	0.02 mg/m ³ - Co Metal and inorganic compounds
Copper	7440-50-8 as Cu	0-4	0.1 mg/m ³ - Fume as CuO 1 mg/m ³ - Cu Dusts & Mists	0.2 mg/m ³ - Fume 1 mg/m ³ - Cu Dusts & Mists
Manganese	7439-96-5 as Mn	0-15	Ceiling 5 mg/m ³ - Metal Fume & Mn Compounds	0.2 mg/m ³ Metal Fume and Mn Compounds
Molybdenum	7439-98-7 as Mo	0-4	15 mg/m ³ -Total Dust 5 mg/m ³ - Respirable ^{4,5}	10 mg/m ³ - Dust 2 mg/m ³ - Respirable
Nickel	7440-02-0 as Ni	0-22	1 mg/m ³ - Ni & Insoluble Compounds	1.5 mg/m ³ - as Ni 0.2 mg/m ³ - Insoluble Compounds
Silicon	7440-21-2 as Si	0-5	15 mg/m ³ -Total Dust 5 mg/m ³ - Respirable ^{4,5}	10 mg/m ³ -Total Dust 3 mg/m ³ - Respirable ^{4,5}
Tungsten	7440-3-7 as W	0-4	15 mg/m ³ -Total Dust 5 mg/m ³ - Respirable ^{4,5}	5 mg/m ³ - Metal & Insoluble Compounds, 10 mg/m ³ - STEL
Coating⁶				
None				

Notes

- CASRN: Chemical Abstract Service Registry Number
- OSHA PEL: OSHA 8- hour Permissible Exposure Limit as listed in 29 CFR 1910.1000 Table Z
- ACGIH TLV: American Conference of Government Industrial Hygienist 8-hour Threshold Limit Values as listed in *2005 Threshold Limit Values for Chemical Substances and Physical Agents*.
- Respirable: Particulates as measured with a cyclone sampling device that collects small particulate matter below a certain cut size, as defined in *NIOSH Manual of Analytical Methods*. Respirable normally means that particulates are small enough to be drawn into the lungs.
- As particles not otherwise regulated (OSHA) or particles not otherwise specified (ACGIH).
- The roll may have a light coating of oil to prevent corrosion.

SECTION 3 – HEALTH HAZARD DATA/EXPOSURE

Summary of Health Hazards

Stainless Steel in its natural state does not pose an immediate health or fire hazard. However welding or heating this material will cause inorganic and organic fumes that are irritating, potentially corrosive and can cause respiratory distress. Mechanical operations such as sawing, grinding, drilling or similar physical operations may cause potentially hazardous airborne particulates which can injure the eyes and skin. These particulates when breathed may cause irritating and corrosive effects to the mouth, nose and respiratory tract.

If it is necessary to weld, heat, saw, grind, drill or any physical operation that will generate a fume or airborne particulates, an exposure assessment should be performed by a qualified industrial hygienist to determine the required personal protection equipment (PPE).

Primary Route(s) of Entry: Inhalation, ingestion, eyes or skin contact. Steel products in the natural state do not present an inhalation, ingestion, eye or skin contact hazard. However operations such as burning, welding, sawing, drilling or grinding may constitute hazards if exposures exceed limits listed in Section 2.

ACUTE EFFECTS OF EXPOSURE

Inhalation: Exposure to high concentrations of metallic fumes and dusts or organic particulates may result in irritation and/or sensitization of the lungs and other mucous membranes. Excessive inhalation of high concentrations of fumes generated from the heating of metals, e.g. zinc, copper and manganese, can produce an acute reaction known as "metal fume fever"

Skin Contact: Exposure to metal dusts may cause irritation or sensitization, possibly leading to dermatitis.

Eye Contact: Impact of metal particles on the eye may cause temporary damage to the eye or possible scarring to the retina, thus producing long term damage. Metal particles may cause rust staining of the eye unless removed. Metallic or organic fumes will cause irritation of the eyes.

Ingestion: Ingestion of harmful amounts is highly unlikely due to its solid insoluble form. Ingestion of dusts may cause nausea and/or vomiting. Heart failure.

MATERIAL CONDITIONS KNOWN TO BE AGGRAVATED BY EXPOSURE TO THIS MATERIAL: Persons with Impaired lungs may be at increased risk from overexposure to fumes generated by heating or welding this product.

CHRONIC EFFECTS OF OVEREXPOSURE**Excessive and Repeated Exposures to Alloy Fume or Dust May Cause:**

- Allergic sensitization – dermatitis and asthma
- Lung inflammation and damage – pneumonitis, pneumonia, bronchitis, siderosis (benign lung disease caused by inhaling iron particles) diffuse pulmonary fibrosis.
- Nasal perforation and nasal cavity damage
- Eye inflammation, Eye stain from imbedded rust particles
- Central nervous system damage, possibly permanent (manganese)
- Kidney damage (copper, manganese, molybdenum)
- Liver damage (copper, molybdenum)
- Gout - Inflammation of the joints (molybdenum)
- See Section 11 for detailed toxicity information on individual components.

Carcinogenicity:

- The carcinogenicity of this product as a whole has not been tested.
- Individual components nickel, chromium and some compounds of these elemental metals have been associated with carcinogenicity by NTP and IARC.
- IARC lists welding fumes as 2B (Possibly carcinogenic to humans)
- No component greater than 0.1% by weight in this alloy is regulated by OSHA within 29 CFR 1910.1000, Subpart Z, as a carcinogen.

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, and tightness of the chest. The symptoms occur a few hours after excessive exposures and usually last from 12 to 48 hours.

SECTION 4 – EMERGENCY & FIRST-AID PROCEDURES

In case of overexposure to metal fumes and/or dusts

Inhalation: Immediately move the people from the contaminated area to fresh air. Give artificial respiration if breathing has stopped; or oxygen if necessary. Seek medical attention. Metal fume fever may be treated by bed rest, and administering a pain and fever reducing medication.

Skin: Remove contaminated clothing immediately. Flush contaminated skin with large quantities of water for fifteen minutes. Seek medical attention.

Eyes: In case of contact, immediately wash eyes with large amounts of water for fifteen minutes, occasionally lifting the lower and upper lids. Seek medical attention.

Ingestion: If conscious, immediately give person large quantities of water. Do not induce vomiting. Seek medical attention.

SECTION 5 – FIRE AND EXPLOSION DATA

The product is: Non-Flammable solid

Auto-ignition Temperature (°F): Not Applicable

Flash Point:(°F): Not Applicable

Flammability Limits (LEL and UEL): Not Applicable

Products of Combustion: Steel is not combustible. Steel might have a light surface coating of oil and this coating may produce carbon decomposition products, which are irritating to eyes and throat. Use water to cool coils

Fire Hazard in the presence of various substances: Oil coated steel will smolder and smoke, but will not burn.

Explosion hazard in the presence of various substances: Material will not burn. Not Applicable

Fire fighting media and instructions: Use water to cool coils. Use appropriate fire extinguishers for surrounding materials. Do not release run off to sewers or waterways

Fire fighting equipment: Wear self-contained breathing apparatus firefighters protective clothing for surrounding fire areas to protect against the generation of metal dust and fumes which are hazardous.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Spill / Leak Procedures: Not applicable to steel products in solid state. For spills of finely divided particles, clean-up personnel should be protected against contact with skin and eyes. Avoid inhalation of dust. Finely divided material should be cleaned up by vacuuming or wet sweeping methods to prevent further dispersal of dust. Do not use compressed air. Collect material in appropriate, labeled containers for recovery or disposal in accordance with federal, state, and local regulations

Regulatory Requirements: Release of this material in a solid form does not require notification of U.S EPA.

SECTION 7 – HANDLING AND STORAGE

Handling Precautions: Avoid the generation of large quantities of metal dusts and airborne particulates. Practice good housekeeping. Avoid breathing metal fumes and dusts.

Special Handling: Do not store steel products adjacent to acids, corrosive materials, materials that generate corrosive gases or incompatible materials.

SECTION 8 – EXPOSURE CONTROLS/PERSONAL PROTECTION

Ventilation: Ventilation, as described in the current *Industrial Ventilation Manual* produced by the American Conference of Governmental Industrial Hygienists, shall be provided in areas where exposures are above the permissible exposure limits or threshold limit values specified by OSHA or other local, state, and federal regulations.

Respiratory Protection: A respirator should be worn whenever airborne concentrations exceed the threshold limit value (TLV) or other recommended limits, in accordance with the OSHA Respiratory Protection Standard (29 CFR 1910.134). A qualified industrial hygienist should be consulted to perform exposure assessment.

Protective Clothing: Use appropriate protective clothing and safety equipment when handling this product. Although not recommended, if heating or welding is required, welder's aprons and gloves, and eye protection should be worn along with safety equipment. An exposure assessment should be conducted by a qualified industrial hygienist to determine proper respiratory protection.

Protective gloves should be worn whenever handling steel scrap or touching the steel coil. An example of such a glove is a Leather Glove with Kevlar Liner.

Eye Protection: Safety glasses and/or face shield (8" minimum) should be worn whenever grinding, cutting or drilling this product. Eyewash/Deluge stations should be located within 10 seconds of work place.

SECTION 9 – PHYSICAL/CHEMICAL CHARACTERISTICS

Evaporation Rate (Ethyl Ether=1)	Not Applicable
Melting Point (°F)	2795 °F as Fe
pH Information	Not Applicable
Percent Volatile by Volume	Not Applicable
Solubility in Water	Not Applicable
Specific Gravity (H ₂ O=1)	> 1.0
Vapor Pressure (mm Hg@25.0°C)	Not Applicable
Vapor Density ((Air=1)	Not Applicable
Appearance and Odor	Gray Metallic Color with No Odor

SECTION 10 - REACTIVITY DATA

Stability: Stainless Steel is stable under normal storage and handling conditions.

Polymerization: Hazardous polymerization will not occur.

Chemical Incompatibilities: Will react with strong acids to form hydrogen gas. Iron Oxide dusts will in react with strong oxidants.

Conditions to Avoid: Storage with strong acids or oxidants.

Hazardous Decomposition Products: Thermal oxidative decomposition of steel can produce fumes containing oxides of individual components. Breathing these fumes may produce respiratory distress and "metal fume fever".

SECTION 11 – TOXICOLOGICAL INFORMATION

Stainless Steel is not toxic in the solid form. The toxicity occurs when processes generate dust and fumes of individual components.

Iron: Chronic inhalation of excessive concentrations of iron oxide fumes or dusts may result in development of a benign pneumoconiosis, called siderosis, which is observable as an x-ray change. 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. Iron Oxide, NIOSH-RTECS: N07400000, fume NIOSH-RTECS: N07525000

Aluminum: Nuisance dust. May cause mild irritation to eyes and mucous membranes. LD₅₀—no data. NIOSH-RTECS: BD0330000

Chromium: Chromium metal has low toxicity in alloyed solid steel products. Chromium metal and trivalent chromium are listed by IARC as group 3 (not classifiable as to carcinogenicity in humans). Hexavalent chromium is classified by IARC as a Group 1 (carcinogenic to humans) and by ACGIH as A1 (confirmed human carcinogen). Hexavalent chromium compounds can act as a strong irritant of skin, eyes, and mucous membranes. LD₅₀ (oral-human) - 71 mg/Kg. NIOSH-RTECS: GB4200000

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.

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 to be carcinogenic to experimental animals by the Federal Republic of Germany. LDLO (oral-human) – 0.28 mg/Kg (brain-degenerative changes, and emphysema) NIOSH-RTECS: GF8750000

Copper: Copper fumes can lead to "metal fume fever" with symptoms of thirst, cough, headache, sweat, pain in limbs and fever. Complete recovery usually occurs within 1 to 2 days of removal from exposure. Copper fumes can also cause nausea, gastric pain, and diarrhea. LD₅₀ (oral-human) - 120 µg/Kg (nausea or vomiting). NIOSH-RTECS: GL53250000

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 have been found in workers exposed to dust or fume of manganese compounds. Manganese compounds are experimental equivocal tumorigenic agents. LD₅₀ (oral, rat) – 30 mg/kg; TC₅₀ – 2300 µg/m³ (man). NIOSH-RTECS: OO9275000

Molybdenum: Inhalation of high concentrations can cause "hard metal lung" disease and pneumoconiosis in workers exposed to high concentrations for extended periods of time. Symptoms of over exposure are anemia and diarrhea. The human body in various metabolic processes uses molybdenum. LD₅₀ – no data. NIOSH-RTECS: QA4680000

Nickel: Can cause allergic dermatitis on contact, pulmonary asthma, and conjunctivitis in high concentrations or chronic exposure to soluble nickel compounds. Metallic nickel is classified by IARC as a Group 2B (possibly carcinogenic to humans), by NTP (reasonably anticipated to be a human carcinogen), and by ACGIH as group A5 (not suspected as a human carcinogen). Nickel compounds are classified by IARC as Group 1 (carcinogenic to humans), by NTP as (known to be carcinogenic to humans), and by ACGIH as Group A1 (confirmed carcinogen in humans). TD₅₀ (oral-rat) – 200mg/Kg (depressed activity). NIOSH-RTECS: QR5950000

Silicon: Nuisance dust. May cause mild irritation to eyes and mucous membranes. LD₅₀ (oral, rat) – 3160 mg/kg. NIOSH-RTECS: VW0400000

Tungsten: Considered mildly toxic and a mild irritant to eyes and skin. LD₅₀ (I.pl-rat) – 5 gm/Kg with regional or general arteriolar or venous dilation with liver and blood changes (not otherwise specified). NIOSH-RTECS: XS5250000

Coating Oils: The oil will cause eye irritation. Repeated or prolonged skin contact will dry the skin and lead to dermatitis. LD₅₀ (oral-mouse) – 22 gm/Kg. NIOSH-RTECS: PY8030000

SECTION 12 – ECOLOGICAL INFORMATION

Stainless Steel is coated with a protective layer and poses no ecological hazard unless the metal is processed to generate dust, fumes, and soluble compounds of the individual components.

Aquatic Toxicity

24 to 96 hour, *Oncorhynchus mykiss* (Rainbow trout), LT₅₀ = 162 µg/L as Al
96 hr, *Pimephales promelas*, (Fathead minnow), LC₅₀ 10-100 mg/L as Chromium
28 Day, *Oncorhynchus mykiss*, (Rainbow trout), LC₅₀ >170 - <15,610 µg/L as Cobalt
24-hour, *Ictalurus punctatus* (Channel catfish), LC₅₀ >0.5% as Iron
4 days post hatch, *Oncorhynchus mykiss*, (Rainbow trout), LC₅₀ 60 - 90 µg/L as Nickel

Terrestrial Toxicity

No data is available for Stainless Steel

SECTION 13 – DISPOSAL INFORMATION

Disposal: Contact supplier or licensed contractor for detailed recommendations. Follow applicable Federal, state and local regulations

SECTION 14 – TRANSPORT INFORMATION

DOT Classification: Not listed as hazardous under 49 CFR 172.101

Special Conditions for Transport: Not Listed as hazardous substance under 49 CFR 172.101

Identification Number: Not Required

Hazardous Material Proper Shipping Name: Not Listed as hazardous substance under 49 CFR 172.10

SECTION 15 – REGULATORY INFORMATION

OSHA Regulations (29 CFR)

Air Contaminant (29 CFR 1910.1000, Table Z): Steel products are not listed as air contaminants. However individual components are listed.

EPA Regulations (40 CFR)

Resource Conservation and Recovery Act (RCRA) - Hazardous Waste: Steel products or scrap are not regulated as a solid waste or hazardous waste under this regulation. Dusts or fumes subject to TCLP toxicity characteristic test may indicate this material is to be classified as a hazardous waste (40CFR261.24).

Comprehensive Emergency Response Compensation and Liability Act (CERCLA) – Superfund: Steel products or scrap are not listed as hazardous substances. Metals in solid form greater than 100 micrometers (0.004 inches) are not required to be reported under CERCLA. [Individual Reportable Quantities, RQ: Chromium (RQ = 5000 lb.), Copper (RQ = 5000 lb.), Nickel (RQ = 100 lb.), Silver (RQ = 1000 lb.), Zinc (RQ = 1000 lb.)].

SARA (Superfund Amendments and Reauthorization Act) Section 311/312 List the hazard class(es) of material : Steel products are not required to be listed. Metals (i.e. chromium, copper, nickel, silver, and zinc) require no reporting of releases of the solid form if the mean diameter is greater than 100 micrometers (0.004 inches).

SARA (Superfund Amendments and Reauthorization Act) Section 313 Toxic Chemicals: Steel products are not subject to reporting requirements.

State Regulations

Steel Products are not listed in state regulations. However, the individual components are listed in various state regulations.

Canada WHMIS (Workplace Hazardous Material Information System)

The material upon further processing has a WHMIS Classification of D-2

SECTION 16 – OTHER INFORMATION

NFPA 704M RATING: Health = 1, Flammability = 0, Reactivity = 0
NFPA Hazard Rating System: Least = 0, Slight = 1, Moderate = 2, High = 3, Extreme = 4

Revisions: Ecological Section added
Sections rearranged along the ANSI Z400.1-2003 guidelines

References: ACIGH TLV's. American Industrial Hygiene Association, 2005
American National Standard for Hazardous Chemicals – MSDS, Z400.1-2003
American National Standard for Hazardous Chemicals – Precautionary Labeling, Z129.1-2005 Proposed
ATSDR- Agency for Toxic Substances and Disease Registry
EPA- IRIS Database for Risk Assessment
EPA – ECOTOX- ECOTOXiology database
EPA- National Primary Drinking Water Standards
IARC- International Agency on Cancer Research
NTP- National Toxicology Program
NIOSH Pocket Guide to Chemical Hazards (NPG), 2005
OSHA – Occupational Safety and Health Act.
RTECS- The Registry of Toxic Effects of Chemical Substances

WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH ON THIS DATA SHEET ARE BELIEVED TO BE ACCURATE, AS OF THE PRESENT DATA, AK STEEL COMPANY, MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.