MATERIAL SAFETY DATA SHEET

Cold Rolled Steel

DATE OF PREPARATION: August 1, 2002
Revised: October 7, 2005, Revision 2

SECTION 1 – CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT/CHEMICAL NAME — **Cold Rolled Steel**

MANUFACTURER'S NAME & TELEPHONE # — **AK STEEL CORPORATION**
513 425-5000 (Information)
800 331-5050 (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	>95.0	10 mg/m^3 - Iron Oxide (Fe_2O_3) Dust and Fume (as Fe)	5 mg/m^3 –Iron Oxide (Fe_2O_3) Dust & Fume as Fe
Alloying Metals				
Aluminum	7429-90-5 as Al	<0.15	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
Boron	7440-42-8 as B	<0.01	15 mg/m^3 -Total Dust as Boron Trioxide (B_20_3)	10 mg/m^3 Total Dust as Boron Oxide (B_20_3)
Calcium	7440-70-2 as Ca	<0.015	15 mg/m^3 - Calcium Oxide (CaO)	2 mg/m^3 - Calcium Oxide (CaO)
Carbon	7440-44-0 as C	<0.30	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]
Chromium	7440-47-3 as Cr	<0.15	1 mg/m^3 – Chromium Metal	0.5 mg/m^3 – Cr Metal & Cr III Compounds
Columbium (Niobium)	7440-03-1 as Nb	<0.10	15 mg/m^3 –Total Dust 5 mg/m^3 – Respirable[4,5]	15 mg/m^3 –Total Dust 3 mg/m^3 – Respirable[4,5]
Copper	7440-50-8 as Cu	<0.15	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	<2.0	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	<0.30	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	<0.15	1 mg/m^3 – Ni & Insoluble Compounds	1.5 mg/m^3 – as Ni 0.2 mg/m^3 – Insoluble Compounds
Phosphorus	7723-14-0 as P	<0.15	1 mg/m^3 as Phosphoric Acid (H_3P0_4)	1 mg/m^3 as Phosphoric Acid
Silicon	7440-21-3 as Si	1.0	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]
Sulfur	7704-34-9 as S	<0.05	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]
Titanium	7440-32-6 as Ti	<0.10	15 mg/m^3 –Total Dust as TiO_2	10 mg/m^3 –Total Dust as TiO_2
Vanadium	7440-62-2 as V	<0.10	0.5 mg/m^3 – Respirable as V_2O_5[4,5] Ceiling 0.1 mg/m^3 – Fume as V_2O_5	0.05 mg/m^3 – Respirable as V_2O_5[4,5]
Metallic Coating				
None				
Coating				
None				

Notes:

1. CASRN: Chemical Abstract Service Registry Number
2. OSHA PEL: OSHA 8- hour Permissible Exposure Limit as listed in 29 CFR 1910.1000 Table Z
3. ACGIH TLV: American Conference of Government Industrial Hygienist 8-hour Threshold Limit Valves as listed in *2005 Threshold Limit Valves for Chemical Substances and Physical Agents.*
4. 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.
5. As particles not otherwise regulated (OSHA) or particles not otherwise specified (ACGIH).
6. % Weight for individual components are for the Coating, not the metal and Coating.
7. Cold Rolled Steel category includes the following:
   - Commercial Steel Types: A, B, C
   - Special Killed
   - Drawing Steel Type B
   - Extra Deep Drawing Steel
   - Extra Deep Drawing Steel Plus
   - Bake Hardenable
   - Dent Resistant
   - Rephosphorized Steel
   - High Strength Low Alloy Steel
   - Structural Steel

   For more description of this product, see the latest edition of AK Steel Corporation Price Book (800-331-5050)
8. The roll may have a light coating of oil to prevent corrosion.

SECTION 3 – HEALTH HAZARD DATA/EXPOSURE

Summary of Health Hazards

Cold Rolled 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 scaring 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.
Explosion hazard in the presence of various substances: Oil coated steel will smolder and smoke, but will not burn.
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 dived 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_2O=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: Cold Rolled 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

Cold Rolled 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. LD_{50} (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. LD_{50}–no data. NIOSH-RTECS: BD0330000

Boron: Boron oxide dusts and fumes may cause upper respiratory tract and eye irritation, dryness of mouth, nose or throat, and sore throat and productive cough. LD_{50} (oral, mouse) – 3163 mg/kg. Boron Oxide: NIOSH-RTECS: ED7900000

Calcium: Concentration of calcium in steel is low but if converted to dust and prolonged exposure occurs inflammation of respiratory tract can occur. Skin irritant. Avoid eye contact. Eye-rabbit: 10 mg severe: calcium hydroxide. LD_{50} (oral-rat) – 7340 mg/Kg. Calcium Oxide, NIOSH-RTECS: EW3100000

Carbon: Nuisance dust. May cause mild irritation to eyes and mucous membranes. LD_{50} – no data

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 ACIGH as A1 (confirmed human carcinogen). Hexavalent chromium compounds can act as a strong irritant of skin, eyes, and mucous membranes. LD_{Lo} (oral-human) - 71 mg/Kg. NIOSH-RTECS: GB4200000

Columbium (Niobium): No data on human intoxication. There is no evidence of a human health hazard. Treat as a nuisance dust. LD_{50} – no data. NIOSH-RTECS: QT9900000

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 nausea, gastric pain, and diarrhea. LD_{Lo} (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. LD_{50} (oral, rat) – 30 mg/kg; TC_{Lo} – 2300 μg/m^3 (man). NIOSH-RTECS: OO9275000

Moybdenum: 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. LD_{50} – 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). TD_{Lo} (oral-rat) – 200mg/Kg (depressed activity). NIOSH-RTECS: QR5950000

Phosphorus: Dust of the phosphorous oxides and ferrophosphorous may cause respiratory irritation. LD_{50} – no data Phosphoric Acid, NIOSH-RTECS: TB6300000

Silicon: Nuisance dust. May cause mild irritation to eyes and mucous membranes. LD_{50} (oral, rat) – 3160 mg/kg. NIOSH-RTECS: VW0400000

Titanium: Nuisance dust. May cause mild irritation to eyes and mucous membranes. TD_{Lo} (oral-rat) – 60 gm/Kg (hypermotility - diarrhea). NIOSH-RTECS: XR2275000

Vanadium: Vanadium as vanadium pentoxide causes bleeding of the nose, asthma, cough, dyspnea, and conjunctivitis. LD_{50} – no data. Vanadium Pentoxide, RTECS: YW2450000

Coating Oils: The oil will cause eye irritation. Repeated or prolonged skin contact will dry the skin and lead to dermatitis. LD_{50} (oral-mouse) – 22 gm/Kg. NIOSH-RTECS: PY8030000

SECTION 12 – ECOLOGICAL INFORMATION

Cold Rolled Steel is 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), LT_{50} = 162 μg/L as Aluminum
96 hr, Pimpehales promelas, (Fathead minnow), LC_{50} 10-100 mg/L as Chromium
24 hr, Oncorhynchus mykiss (Rainbow trout), LT_{50} = 130-140 μg/L as Copper
24-hour, Ictalurus punctarus (Channel catfish), LC_{50} >0.5% as Iron
4 days post hatch, Omcorhynchus mykiss, (Rainbow trout), LC_{50} 60-90 μg/L as Nickel

Terrestrial Toxicity

No data is available for Cold Rolled 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 CRF 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 (40CRF261.24).

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.), Copper (RQ = 5000 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

Safety Data Sheet

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

In accordance with the REACH Implementation Project (RIP) 3.8, "Technical Guidance Document on Requirements for Substances in Articles", the product(s) identified by this SDS are classified as an "article" under REACH regulations and the "substances" it contains are not intended for release and not subject to registration requirements.

Material Name: Electrogalvanized Carbon Steels

Product Code: Includes but is not limited to CS Type B, DS Type B, EDDS, EDDS+, Dent Resistant and Bake Hardenable

CAS Number: 12597-69-2 **Chemical Category:** Zinc Compounds, Metals

EINECS: No Data Available EU Number: No Data Available

Product Description:

Electrogalvanized carbon steel products offer superior surface quality and high corrosion resistance, plus excellent formability paintability for automotive exterior panels and other exposed applications where these attributes are critical. Pure zinc coatings applied to AK Steel's top quality cold rolled sheet steel deliver both galvanic and barrier protection against rust formation.

Product Use: Automotive exterior panels

Synonyms: Carbon Steel, ZINCGRIP Electrosmooth Steel

Company Identification
AK Steel Corporation
9227 Centre Pointe Drive
West Chester, OH 45069
United States
www.aksteel.com
General Information: 513-425-5000
Customer Service: 800-331-5050

SECTION 2 - HAZARDS IDENTIFICATION

Emergency Overview

All health hazards listed in this SDS relate to welding fumes or airborne particulates. Electrogalvanized Carbon Steel is not toxic in its solid form. The toxicity occurs only when processes generate dust and fumes of individual components.

SUMMARY OF HEALTH HAZARDS: Electrogalvanized Carbon 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).

Physical Form: Solid - Gray metallic color with no odor

Hazards: Irritant, Skin Sensitizer, Respiratory Sensitizer (Fumes and or dust)

EU: Sensitizer, Irritant, R20, R20/21, R48/20, R68/20, R36/37/38, R42/43, R43

Route Of Entry: Inhalation, Skin/Dermal, Eye/Ocular (Fumes and or dust)

NFPA:

Health - 2: Based on welding fumes.

Potential Health Effects:

Inhalation: Acute (Immediate): 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 can produce an acute reaction known as "metal fume fever".

Chronic (Delayed): Excessive and Repeated Exposure to Alloy Fume or Dust May Cause Lung Inflammation and Damage - Pneumonitis, Pneumonia, Bronchitis, Siderosis (benign lung disease caused by inhaling iron particles), and Diffuse Pulmonary Fibrosis.

Skin: Acute (Immediate): Exposure to metal dusts may cause irritation or sensitization, possibly leading to dermatitis.

Chronic (Delayed): Allergic sensitization may lead to dermatitis.

Eye: Acute (Immediate): Mechanical operations such as sawing, grinding, drilling or similar physical operations may cause potentially hazardous airborne particulates which can injure the eyes and skin. 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 to the eyes.

Chronic (Delayed): Impact of metal particles on the eye may cause scarring of the retina, thus producing long term damage.

Ingestion: Acute (Immediate): Ingestion of harmful amounts is highly unlikely due to it solid insoluble form. Ingestion of dusts may cause nausea and/or vomiting.

Chronic (Delayed): Ingestion of harmful amounts is highly unlikely due to its solid insoluble form. Ingestion of metal dusts – chromium VI compounds - may cause irritation and ulcers in the stomach and small intestine, and anemia.

Mutagenic Effects: Repeated overexposure to chromium VI compounds may cause alteration of genetic material.

Carcinogenic Effects: Repeated and prolonged overexposure to chromium VI compounds may cause lung cancer.

Reproductive Effects: Sperm damage and damage to the male reproductive system have been seen in laboratory animals exposed to chromium VI.

No significant health effects have been documented from exposure to Chromium II or Chromium II compounds.

Potential Environmental Effects:

Release of this material in its solid state does not pose an environmental hazard unless the metal is processed to generate dusts, fumes, and soluble compounds of the individual components. Chromium compounds do not usually remain in the atmosphere, but are deposited in the soil and water. Chromium can easily change from one form to another in water and soil, depending on the conditions present. Fish typically do not accumulate much chromium in their bodies from water.

See Section 12 for Ecological Information

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Components

Chemical Name	CAS	% (weight)	UN;EINICS	LD50/LC50	EU	Other
Zinc	7440-66-6	100%	UN1435; UN1436; 231-175-3	NDA	R15, R17 N; R50-53;	Metallic Coating
Nickel	7440-02-0	< 0.20%	231-111-4	Oral LD50 Rat: >9000 mg/kg	Carc.Cat.3;R40 R43	Ingredient
Chromium	7440-47-3	< 0.15%	231-157-5	NDA	NDA	Ingredient
Phosphorus	7723-14-0	< 0.15%	UN1381; UN2447; 231-768-7	Inhalation LC50 Rat: 4.3 mg/L/1H; Oral LD50 Rat:3.03 mg/kg;	F;R11 R16 R52-53	Ingredient
Aluminum	7429-90-5	< 0.10%	231-111-4	Oral LD50 Rat: 200 mg/kg	R15 R10	Ingredient
Calcium	7440-70-2	< 0.10%	UN1401; UN1855; 231-179-5	NDA	R15	Ingredient
Copper	7440-50-8	< 0.20%	231-159-6	NDA	NDA	Ingredient

Non-Hazardous Components

Chemical Name	CAS	% (weight)	UN;EINICS	LD50/LC50	EU	Other
Iron	7439-89-6	> 95.0%	231-096-4	Oral LD50 Rat: 30 g/kg	NDA	Ingredient
Silicon	7440-21-3	< 1.0%	231-130-8	Oral LD50 Rat: 3160 mg/kg	NDA	Ingredient
Manganese	7439-96-5	< 2.0%	231-105-1	Oral LD50 Rat: 9 g/kg	NDA	Ingredient
Carbon	7440-44-0	< 0.30%	231-153-3	Oral LD50 Rat: >10000 mg/kg	NDA	Ingredient
Molybdenum	7439-98-7	< 0.30%	231-107-2	NDA	NDA	Ingredient
Niobium (Columbium)	7440-03-1	< 0.10%	231-113-5	NDA	NDA	Ingredient
Vanadium	7440-62-2	< 0.10%	231-171-1	NDA	NDA	Ingredient
Sulfur	7704-34-9	< 0.05%	231-722-6	Inhalation LC50 Rat: >9.23 mg/L/4H; Oral LD50 Rat:>3000 mg/kg; Dermal LD50 Rabbit:>2000 mg/kg	NDA	Ingredient
Boron	7440-42-8	< 0.01%	231-151-2	Oral LD50 Rat: 650 mg/kg	NDA	Ingredient

See Section 11 for Toxicological Information

SECTION 4 - FIRST AID MEASURES

Inhalation: In case of overexposure to metal fumes and/or dusts immediately move the people from the contaminated area to fresh air. Give artificial respiration if breathing has stopped; or if necessary give oxygen. Seek medical attention. Metal fume fever may be treated by bed rest, and administering a pain and fever reducing medication.

Skin: In case of overexposure to metal fumes and/or dusts remove contaminated clothing immediately. Flush contaminated skin with large amounts of water for fifteen minutes. Seek medical attention.

Eye: In case of overexposure to metal fumes and/or dusts - 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: Seek medical attention

See Section 2 for Potential Health Effects

SECTION 5 - FIRE FIGHTING MEASURES

Suitable Extinguishing Media: Steel is not combustible. Steel may have a light surface coating of oil and this coating may produce carbon decomposition products, which are irritating to the eyes and throat.

Firefighting Procedures: Use water to cool coils. Use appropriate fire extinguishers for surrounding materials. Do not release run off to sewers or waterways

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions: 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.

SECTION 7 - HANDLING AND STORAGE

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

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

Other Information: Release of this material in solid form does not require notification of regulatory agencies.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

General Information: An exposure assessment should be conducted by a qualified industrial hygienist prior to any activities that may cause exposure to metal fumes or airborne particulates.

PPE: 

- 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 an exposure assessment prior to any activities that may cause exposure to metal fumes or airborne particulates.
- Eye/Face 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 the workplace.
- Hands 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.
- Skin/Body Protection: 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.

Listed Exposure Limits:

Europe

- Chromium (7440-47-3): **TWAs:** (2 mg/m3 TWA)
- Electrogalvanized Carbon Steels (RR-16884-3): **TWAs:** (2 mg/m3 TWA (insoluble))

United States - OSHA

- Copper (7440-50-8): **TWAs (Final PELs):** (0.1 mg/m3 TWA (fume); 1 mg/m3 TWA (dust and mist))
- Phosphorus (7723-14-0): **TWAs (Final PELs):** (0.1 mg/m3 TWA)
- Chromium (7440-47-3): **TWAs (Final PELs):** (1 mg/m3 TWA)
- Aluminum (7429-90-5): **TWAs (Final PELs):** (15 mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable fraction))
- Nickel (7440-02-0): **TWAs (Final PELs):** (1 mg/m3 TWA)
- Silicon (7440-21-3): **TWAs (Final PELs):** (15 mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable fraction))
- Electrogalvanized Carbon Steels (RR-00023-7): **TWAs (Final PELs):** (0.5 mg/m3 TWA (as Cr)) | **TWAs (Final PELs):** (5 µg/m3 TWA) | **TWAs (Final PELs):** (0.5 mg/m3 TWA (as Cr)) | **TWAs (Final PELs):** (1 mg/m3 TWA (as Cr))

United States - ACGIH

- Copper (7440-50-8): **TWAs:** (0.2 mg/m3 TWA (fume); 1 mg/m3 TWA (dust and mist, as Cu))
- Chromium (7440-47-3): **TWAs:** (0.5 mg/m3 TWA)
- Manganese (7439-96-5): **TWAs:** (0.2 mg/m3 TWA)
- Aluminum (7429-90-5): **TWAs:** (1 mg/m3 TWA (respirable fraction))
- Molybdenum (7439-98-7): **TWAs:** (10 mg/m3 TWA (inhalable fraction); 3 mg/m3 TWA (respirable fraction))
- Nickel (7440-02-0): **TWAs:** (1.5 mg/m3 TWA (inhalable fraction))
- Electrogalvanized Carbon Steels (RR-00025-9): **TWAs:** (0.05 mg/m3 TWA (as Cr)) | **TWAs:** (0.05 mg/m3 TWA (as Cr)) | **TWAs:** (0.01 mg/m3 TWA (as Cr)) | **TWAs:** (0.5 mg/m3 TWA (as Cr))

United States - NIOSH

- Copper (7440-50-8): **TWAs:** (1 mg/m3 TWA (dust and mist))
- Phosphorus (7723-14-0): **TWAs:** (0.1 mg/m3 TWA)
- Chromium (7440-47-3): **TWAs:** (0.5 mg/m3 TWA)
- Manganese (7439-96-5): **TWAs:** (1 mg/m3 TWA (fume))
- Aluminum (7429-90-5): **TWAs:** (10 mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable dust))
- Nickel (7440-02-0): **TWAs:** (0.015 mg/m3 TWA)
- Silicon (7440-21-3): **TWAs:** (10 mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable dust))
- Vanadium (7440-62-2): **TWAs:** (1 mg/m3 TWA (dust, listed under Ferrovanadium dust))
- Electrogalvanized Carbon Steels (RR-00023-7): **TWAs:** (0.5 mg/m3 TWA (as Cr)) | **TWAs:** (0.001 mg/m3 TWA (as Cr)) | **TWAs:** (0.5 mg/m3 TWA (as Cr)) |
  |

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Physical Form: Solid

Appearance/Description: Gray metallic color with no odor.

Melting Point: 2795 ^{O}F as Fe (= 1535 ^{O}C), 787 ^{O}F as Zinc (= 419.4 ^{O}C)

SECTION 10 - STABILITY AND REACTIVITY

Stability: Electrogalvanized Carbon Steels are stable under normal storage and handling conditions.

Conditions to Avoid: Do not store steel products adjacent to acids, corrosive materials, materials that generate corrosive gases, or other incompatible materials. Will react with strong acids to form hydrogen gas. Iron Oxide dusts will react with strong oxidants.

SECTION 11 - TOXICOLOGICAL INFORMATION

Electrogalvanized Carbon Steel is not toxic in its solid form. The toxicity occurs only when processes generate dust and fumes of individual components.

Component Name	Concentration	CAS	Data
Carbon	< 0.30%	7440-44-0	Oral LD50 Rat: >10000 mg/kg
Phosphorus	< 0.15%	7723-14-0	Inhalation LC50 Rat: 4.3 mg/L/1H; Oral LD50 Rat:3.03 mg/kg; Dermal LD50 Rat:100 mg/kg
Manganese	< 2.0%	7439-96-5	Oral LD50 Rat: 9 g/kg
Nickel	< 0.20%	7440-02-0	Oral LD50 Rat: >9000 mg/kg
Silicon	< 1.0%	7440-21-3	Oral LD50 Rat: 3160 mg/kg
Iron	> 95.0%	7439-89-6	Oral LD50 Rat: 30 g/kg
Sulfur	< 0.05%	7704-34-9	Inhalation LC50 Rat: >9.23 mg/L/4H; Oral LD50 Rat:>3000 mg/kg; Dermal LD50 Rabbit:>2000 mg/kg
Boron	< 0.01%	7440-42-8	Oral LD50 Rat: 650 mg/kg

Other Information:

Aluminum: Nuisance dust. May cause mild irritation to eyes and mucous membranes. LD_{50}–no data. NIOSH-RTECS: BD0330000

Boron: Boron oxide dusts and fumes may cause upper respiratory tract and eye irritation, dryness of mouth, nose or throat, and sore throat and productive cough. LD_{50} (oral, mouse) – 3163 mg/kg. Boron Oxide: NIOSH-RTECS: ED7900000

Calcium: Concentration of calcium in steel is low but if converted to dust and prolonged exposure occurs - inflammation of the respiratory tract can occur. Skin irritant. Avoid eye contact. Eye-rabbit: 10 mg severe: calcium hydroxide. LD_{50} (oral-rat) – 7340 mg/Kg. Calcium Oxide, NIOSH-RTECS: EW3100000

Carbon: Nuisance dust. May cause mild irritation to eyes and mucous membranes. LD_{50} – no data

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 nausea, gastric pain, and diarrhea. LD_{Lo} (oral-human) - 120 μg/Kg (nausea or vomiting). NIOSH-RTECS: GL53250000

Columbium (Niobium): No data on human intoxication. There is no evidence of a human health hazard. Treat as a nuisance dust. LD_{50} – no data. NIOSH-RTECS: QT9900000

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 ACIGH as A1 (confirmed human carcinogen). Hexavalent chromium compounds can act as a strong irritant of skin, eyes, and mucous membranes. LD_{Lo} (oral-human) - 71 mg/Kg. NIOSH-RTECS: GB4200000

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 concentration of iron oxide may enhance the risk of lung cancer development in workers exposed to pulmonary carcinogens. LD_{50} (oral, rat) - 30g/kg. Iron Oxide, NIOSH-RTECS: N07400000, fume NIOSH-RTECS: N07525000.

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. LD_{50} (oral, rat) - 30 mg/kg; TC_{LO} - 2300 micrograms/m3 (man). NIOSH-RTECS: QR5950000.

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. LD_{50} – 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). TD_{Lo} (oral-rat) – 200mg/Kg (depressed activity). NIOSH-RTECS: QR5950000

Phosphorus: Dust of the phosphorous oxides and ferrophosphorus may cause respiratory irritation. LD_{50} – no data Phosphoric Acid, NIOSH-RTECS: TB6300000

Silicon: Nuisance dust. May cause mild irritation to eyes and mucous membranes. LD_{50} (oral, rat) – 3160 mg/kg. NIOSH-RTECS: VW0400000

Titanium: Nuisance dust. May cause mild irritation to eyes and mucous membranes. TD_{Lo} (oral-rat) – 60 gm/Kg (hypermotility - diarrhea). NIOSH-RTECS: XR2275000

Vanadium: Vanadium as vanadium pentoxide causes bleeding of the nose, asthma, cough, dyspnea, and conjunctivitis. LD_{50} – no data. Vanadium Pentoxide, RTECS: YW2450000

Zinc: The primary toxicological effect due is the inhalation of zinc fumes, formed when heating, burning or welding a zinc coated surface, such galvanizing. Overexposure to zinc fumes will cause metal fume fever. Attacks usually begin after 4 to 8 hours after exposure and consist of chills and fever, profuse sweating and weakness. Attacks usually last only 24 to 48 hours. Any person who suspects they are experiencing metal fume fever should seek medical assistance. TC_{Lo} (inhalation-human) – 600 mg/m^3 (cough-dyspnea). Zinc Oxide, NIOSH-RTECS: ZH4810000

SECTION 12 - ECOLOGICAL INFORMATION

Ecological Fate: Persistent in the environment.

Persistance/Degradablity: Persistent in the environment.

Other Information: Electrogalvanized Carbon Steel poses no ecological hazard unless the metal is processed to generate dust, fumes, and soluble compounds of the individual components.

SECTION 13 - DISPOSAL CONSIDERATIONS

Product: Recommend recycling of solid waste. Metal dust and particles can be recycled in some areas. Contact supplier or local licensed contractor for detailed recommendations. Follow all applicable local regulations. Refer to manufacturer/supplier for information on recovery/recycling.

SECTION 14 - TRANSPORTATION INFORMATION

U.S. DOT 49 CFR 172.101:
Shipping Name: Not Regulated

TDG - CANADA - Transport of Dangerous Goods:
Shipping Name: Not Regulated

IMO/IMDG –International Maritime Transport:
Shipping Name: Not Regulated

SECTION 15 - REGULATORY INFORMATION

Risk & Safety Phrases: In accordance with the REACH Implementation Project (RIP) 3.8, "Technical Guidance Document on Requirements for Substances in Articles", the product(s) identified by this SDS are classified as an "article" under REACH regulations and the "substances" it contains are not intended for release and not subject to registration requirements.

Electrogalvanized Carbon Steel products in solid form are not listed as air contaminants. However, individual components are listed. Steel products or scrap are not regulated as a solid waste or hazardous waste.

Canada
Labor

Canada - WHMIS - Classifications of Substances

• Calcium	(7440-70-2)	B6, E
• Carbon	(7440-44-0)	Uncontrolled product according to WHMIS classification criteria
• Copper	(7440-50-8)	Uncontrolled product according to WHMIS classification criteria
• Phosphorus	(7723-14-0)	B4, D1A, E
• Chromium	(7440-47-3)	Uncontrolled product according to WHMIS classification criteria
• Manganese	(7439-96-5)	D2A (including powder)
• Aluminum	(7429-90-5)	B6 (powder); Uncontrolled product according to WHMIS classification criteria
• Molybdenum	(7439-98-7)	Uncontrolled product according to WHMIS classification criteria
• Silicon	(7440-21-3)	B4
• Nickel	(7440-02-0)	D2A, D2B; B6, D2A (Raney)
• Iron	(7439-89-6)	Uncontrolled product according to WHMIS classification criteria
• Sulfur	(7704-34-9)	B4

Canada - WHMIS - Ingredient Disclosure List

• Copper	(7440-50-8)	1%
• Phosphorus	(7723-14-0)	1%
• Chromium	(7440-47-3)	0.1%
• Manganese	(7439-96-5)	1%
• Aluminum	(7429-90-5)	1%
• Molybdenum	(7439-98-7)	1%
• Nickel	(7440-02-0)	0.1%
• Vanadium	(7440-62-2)	1%

Europe
Environment

EU - European Pollutant Emission Register (EPER) (2000/479/EC) - Threshold Quantities

• Carbon	(7440-44-0)	50000 kg TQ (water, as C or COD/3)
• Copper	(7440-50-8)	100 kg TQ (air); 50 kg TQ (water)
• Phosphorus	(7723-14-0)	5000 kg TQ (water)
• Chromium	(7440-47-3)	100 kg TQ (air); 50 kg TQ (water)
• Nickel	(7440-02-0)	50 kg TQ (air); 20 kg TQ (water)
• Zinc	(7440-66-6)	200 kg TQ (air); 50 kg TQ (water)

SECTION 16 - OTHER INFORMATION

Preparation By: Dr. Phillip L. Hayden, CIH

Preparation Date: 7/14/2009

Last Revision Date: 7/27/09

DISCLAIMER/STATEMENT OF LIABILITY: WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH IN THE SAFETY DATA SHEET ARE BELIEVED TO BE ACCURATE, AS OF THE PRESENT DATA, AK STEEL COPORATION MAKES NO WARRANTY WITH RESPECT THERETO, AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

MATERIAL SAFETY DATA SHEET

ZINCGRIP® Steel

DATE OF PREPARATION: August 1, 2002
Revised October 7,2005, Revision 2

SECTION 1 – CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT/CHEMICAL NAME — **ZINCGRIP® Steel**

MANUFACTURER'S NAME & TELEPHONE # — **AK STEEL CORPORATION**
513 425-5000 (Information)
800 331-5050 (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	>95.0	10 mg/m^3 - Iron Oxide (Fe_2O_3) Dust and Fume (as Fe)	5 mg/m^3 –Iron Oxide (Fe_2O_3) Dust & Fume as Fe
Alloying Metals				
Aluminum	7429-90-5 as Al	<0.10	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
Boron	7440-42-8 as B	<0.01	15 mg/m^3 -Total Dust as Boron Trioxide (B_20_3)	10 mg/m^3 Total Dust as Boron Oxide (B_20_3)
Calcium	7440-70-2 as Ca	<0.10	15 mg/m^3 - Calcium Oxide (CaO)	2 mg/m^3 - Calcium Oxide (CaO)
Carbon	7440-44-0 as C	<0.30	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]
Chromium	7440-47-3 as Cr	<0.15	1 mg/m^3 – Chromium Metal	0.5 mg/m^3 – Cr Metal & Cr III Compounds
Columbium (Niobium)	7440-03-1 as Nb	<0.10	15 mg/m^3 –Total Dust 5 mg/m^3 – Respirable[4,5]	15 mg/m^3 –Total Dust 3 mg/m^3 – Respirable[4,5]
Copper	7440-50-8 as Cu	<0.20	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	<2.0	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	<0.30	15 mg/m^3 –Total Dust 5 mg/m^3 – Respirable[4,5]	10 mg/m^3 – Dust 2 mg/m^3 – Respirable[4,5]
Nickel	7440-02-0 as Ni	<0.20	1 mg/m^3 – Ni & Insoluble Compounds	1.5 mg/m^3 – as Ni 0.2 mg/m^3 – Insoluble Compounds
Phosphorus	7723-14-0 as P	<0.15	1 mg/m^3 as Phosphoric Acid (H_3P0_4)	1 mg/m^3 as Phosphoric Acid
Silicon	7440-21-3 as Si	<1.0	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]
Sulfur	7704-34-9 as S	<0.05	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]
Titanium	7440-32-6 as Ti	<0.10	15 mg/m^3 –Total Dust as TiO_2	10 mg/m^3 –Total Dust as TiO_2
Vanadium	7440-62-2 as V	<0.10	0.5 mg/m^3 – Respirable as V_2O_5[4,5] Ceiling 0.1 mg/m^3 – Fume as V_2O_5	0.05 mg/m^3 – Respirable as V_2O_5[4,5]
Metallic Coating[6]				
Zinc	7440-66-6 as Zn	100.0	15 mg/m^3 –Total Dust as ZnO 5 mg/m^3 – Respirable[4,5] & Fume, ZnO	2 mg/m^3 – Respirable[4,5] as ZnO STEL 10 mg/m^3 – Respirable[4,5]
Coating				
None				

Notes:

1. CASRN: Chemical Abstract Service Registry Number
2. OSHA PEL: OSHA 8-hour Permissible Exposure Limit as listed in 29 CFR 1910.1000 Table Z
3. ACGIH TLV: American Conference of Government Industrial Hygienist 8-hour Threshold Limit Valves as listed in *2005 Threshold Limit Valves for Chemical Substances and Physical Agents.*
4. 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*.
5. As particles not otherwise regulated.
6. % Weight for individual components are for the Metallic Coating, not the base metal and Coating,
7. ZINCGRIP® Steel Quality Extras include the following:
   - Commercial Steel Type B
   - Special Killed
   - Extra Deep Drawing Steel
   - Extra Deep Drawing Steel Plus
   - Dent Resistant
   - Structural Steel
   - High Strength Low Alloy Steel
8. Steel coils may be coated with a light coating oil to prevent corrosion.

SECTION 3 – HEALTH HAZARD DATA/EXPOSURE

Summary of Health Hazards

ZINCGRIP® 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 scars to the retina, thus producing long 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 dived 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, 787°F as Zinc
pH Information	Not Applicable
Percent Volatile by Volume	Not Applicable
Solubility in Water	Not Applicable
Specific Gravity (H_2O=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: ZINCGRIP® 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 coatings containing zinc can produce fumes containing oxides of zinc. Breathing zinc oxide fumes may produce respiratory distress and "metal fume fever".

SECTION 11 – TOXICOLOGICAL INFORMATION

ZINCGRIP® 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. LD_{50} (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. LD_{50}–no data. NIOSH-RTECS: BD0330000

Boron: Boron oxide dusts and fumes may cause upper respiratory tract and eye irritation, dryness of mouth, nose or throat, and sore throat and productive cough. LD_{50} (oral, mouse) – 3163 mg/kg. Boron Oxide: NIOSH-RTECS: ED7900000

Calcium: Concentration of calcium in steel is low but if converted to dust and prolonged exposure occurs inflammation of respiratory tract can occur. Skin irritant. Avoid eye contact. Eye-rabbit: 10 mg severe: calcium hydroxide. LD_{50} (oral-rat) – 7340 mg/Kg. Calcium Oxide, NIOSH-RTECS: EW3100000

Carbon: Nuisance dust. May cause mild irritation to eyes and mucous membranes. LD_{50} – no data

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 ACIGH as A1 (confirmed human carcinogen). Hexavalent chromium compounds can act as a strong irritant of skin, eyes, and mucous membranes. LD_{Lo} (oral-human) - 71 mg/Kg. NIOSH-RTECS: GB4200000

Columbium (Niobium): No data on human intoxication. There is no evidence of a human health hazard. Treat as a nuisance dust. LD_{50} – no data. NIOSH-RTECS: QT9900000

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 nausea, gastric pain, and diarrhea. LD_{Lo} (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. LD_{50} (oral, rat) – 30 mg/kg; TC_{Lo} – 2300 μg/m^3 (man). NIOSH-RTECS: OO9275000

Moybdenum: 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. LD_{50} – 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). TD_{Lo} (oral-rat) – 200mg/Kg (depressed activity). NIOSH-RTECS: QR5950000

Phosphorus: Dust of the phosphorous oxides and ferrophosphorous may cause respiratory irritation. LD_{50} – no data Phosphoric Acid, NIOSH-RTECS: TB6300000

Silicon: Nuisance dust. May cause mild irritation to eyes and mucous membranes. LD_{50} (oral, rat) – 3160 mg/kg. NIOSH-RTECS: VW0400000

Titanium: Nuisance dust. May cause mild irritation to eyes and mucous membranes. TD_{Lo} (oral-rat) – 60 gm/Kg (hypermotility - diarrhea). NIOSH-RTECS: XR2275000

Vanadium: Vanadium as vanadium pentoxide causes bleeding of the nose, asthma, cough, dyspnea, and conjunctivitis. LD_{50} – no data. Vanadium Pentoxide, RTECS: YW2450000

Zinc: The primary toxicological effect due is the inhalation of zinc fumes, formed when heating, burning or welding a zinc coated surface, such galvanizing. Overexposure to zinc fumes will cause metal fume fever. Attacks usually begin after 4 to 8 hours after exposure and consist of chills and fever, profuse sweating and weakness. Attacks usually last only 24 to 48 hours. Any person who suspects they are experiencing metal fume fever should seek medical assistance. TC_{Lo} (inhalation-human) – 600 mg/m^3 (cough-dyspnea). Zinc Oxide, NIOSH-RTECS: ZH4810000

Coating Oils: The oil will cause eye irritation. Repeated or prolonged skin contact will dry the skin and lead to dermatitis. LD_{50} (oral-mouse) – 22 gm/Kg. NIOSH-RTECS: PY8030000

SECTION 12 – ECOLOGICAL INFORMATION

ZINCGRIP® 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-hour, Ictalurus punctarus (channel catfish), LC_{50} >0.5% as Iron
96 hr, Pimpehales promelas, fathead minnow, LC_{50} 10-100 mg/L as Chromium
4 days post hatch, Omcorhynchus mykiss, Rainbow trout, LC_{50} 60-90 μg/L as Nickel
3-hour and 9 hour, Bufo bufo japonicus (Toad), LC_{50} = 3.2 mg/L as Zinc ion
Terrestrial Toxicity
8 weeks, Eisenia Fetida,earthworm, NOEC 26,000 mg/Kg as Zn
8-day ,Colinus virginianus (Northern Bobwhite), LC_{50} > 5000ppm as Zinc Oxide
8.5 weeks, 0-survival Porcellio scaber (woodlice) exposed to soil as Zinc Oxide

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 CRF 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 (40CRF261.24).

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.), Copper (RQ = 5000 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