



United States Steel Corporation

Material Safety Data Sheet

USS Code Number: 3C013

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Section 1 - Chemical Product and Company Identification

Product/Chemical Name: Galvanized (Electrolytic) Sheet;
Galvannealed (Electrolytic) Sheet

Manufacturer: United States Steel Corporation, 600 Grant Street, Room 2514H, Pittsburgh, PA 15219-2800

General Information: (412) 433-6840 (8:00 am to 5:00 pm); FAX: (412) 433-5016

Off-Hour Emergency Phone Number: (412) 433-5811

Section 2 - Composition / Information on Ingredients

Ingredient Name	CAS Number	Percentage by wt.	OSHA PEL ¹	ACGIH TLV ²
Base Metal				
Iron	7439-89-6	>95.0	10 mg/m ³ - Iron oxide fume	5 mg/m ³ - Iron oxide dust and fume
Alloying Elements				
Aluminum	7429-90-5	0.10 max.	15 mg/m ³ - Total dust 5 mg/m ³ - Respirable fraction	10 mg/m ³ - Metal Dust 5 mg/m ³ - Welding fume
Boron	7440-42.8	0.006 max.	15 mg/m ³ - Total dust (as Boron oxide)	10 mg/m ³ - Boron oxide
Carbon	7440-44-0	0.005-0.60	15 mg/m ³ - Total dust (PNOR) ³ 5 mg/m ³ - Respirable fraction (PNOR)	10 mg/m ³ - Inhalable fraction ⁴ (PNOS) ⁵ 3 mg/m ³ - Respirable fraction ⁶ (PNOS)
Manganese	7439-96-5	0.05-1.5	5 mg/m ³ (C) - Fume & Mn compounds	0.2 mg/m ³
Phosphorus	8049-19-2	0.15 max.	15 mg/m ³ - Total dust (PNOR) 5 mg/m ³ - Respirable fraction (PNOR)	10 mg/m ³ - Inhalable fraction (PNOS) 3 mg/m ³ - Respirable fraction (PNOS)
Sulfur	7704-34-9	0.05 max.	15 mg/m ³ - Total dust (PNOR) 5 mg/m ³ - Respirable fraction (PNOR)	10 mg/m ³ - Inhalable fraction (PNOS) 3 mg/m ³ - Respirable fraction (PNOS)
Metallic Coating *				
Zinc	7440-66-6	0.14-4.2	5 mg/m ³ - Fume 15 mg/m ³ - Total dust 5 mg/m ³ - Respirable fraction	5 mg/m ³ - Fume 10 mg/m ³ - Fume (STEL) 10 mg/m ³ - Dust
Iron	7439-89-6	0.75 max.	10 mg/m ³ - Iron oxide fume	5 mg/m ³ - Iron oxide dust and fume

Notes:

- * Percent weight of metallic coating is a percent of the total product.
- Electrolytic galvanized sheet/strip surface may be coated with a small amount (<0.05%) of corrosion-inhibiting oil.
- All commercial steel products may contain small amounts of various elements in addition to those specified. These small quantities (less than 0.1%) may exist as intentional additions, or as "trace" or "residual" elements that generally originate in the raw materials used. These elements may include: aluminum, antimony, arsenic, boron, cadmium, calcium, chromium, cobalt, columbium, copper, lead, molybdenum, nickel, silicon, tin, titanium, vanadium, and zirconium.

¹ OSHA Permissible Exposure Limits (PELs) are 8-hour TWA (time-weighted average) concentrations unless otherwise noted. A ("C") designation denotes a ceiling limit, which should not be exceeded during any part of the working exposure unless otherwise noted. A Short Term Exposure Limit (STEL) is defined as a 15-minute exposure, which should not be exceeded at any time during a workday.

² Threshold Limit Values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) are 8-hour TWA concentrations unless otherwise noted.

³ PNOR (Particulates Not Otherwise Regulated). All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the PNOR limit which is the same as the inert or nuisance dust limit of 15 mg/m³ for total dust and 5 mg/m³ for the respirable fraction.

⁴ Inhalable fraction. The concentration of inhalable particulate for the application of this TLV is to be determined from the fraction passing a size-selector with the characteristics defined in the ACGIH TLVs and BEIs Appendix D, paragraph A.

⁵ PNOS (Particulates Not Otherwise Specified). Particulates identified under the PNOS heading are "nuisance dusts" containing no asbestos and <1% crystalline silica. A TWA-TLV of 10 mg/m³ for inhalable particulate and 3 mg/m³ for respirable particulate has been recommended.

⁶ Respirable fraction. The concentration of respirable dust for the application of this limit is to be determined from the fraction passing a size-selector with the characteristics defined in the ACGIH TLVs and BEIs Appendix D, paragraph C.

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

This formed solid metal product poses little or no immediate health or fire hazard. When product is subjected to welding, burning, melting, sawing, brazing, grinding, or other similar processes, potentially hazardous airborne particulate and fumes may be generated. Avoid inhalation of metal dusts and fumes. Operations having the potential to generate airborne particulates should be performed in well ventilated areas and, if appropriate, respiratory protection and other personal protective equipment should be used. Iron or steel foreign bodies imbedded in the cornea of the eye may produce rust stains unless removed fairly promptly.

Potential Health Effects

Primary Entry Routes: Inhalation and skin, if coated. Steel products in the natural state do not present an inhalation, ingestion or contact hazard. However, operations such as burning, welding, sawing, brazing, machining and grinding may result in the following effects if exposures exceed recommended limits as listed in Section 2.

Target Organs: Respiratory system.

Acute Effects:

- **Inhalation:** Excessive exposure to high concentrations of dust may cause irritation to the eyes, skin and mucous membranes of the upper respiratory tract. Excessive inhalation of fumes of freshly formed metal oxide particles sized below 1.5 microns and usually between 0.02-0.05 microns from many metals can produce an acute reaction known as "metal fume fever". Symptoms consist of chills and fever (very similar to and easily confused with flu symptoms), metallic taste in the mouth, dryness and irritation of the throat followed by weakness and muscle pain. The symptoms come on in a few hours after excessive exposures and usually last from 12 to 48 hours. Long-term effects from metal fume fever have not been noted. Freshly formed oxide fumes of manganese and zinc have been associated with causing metal fume fever. Although not expected to cause effects based upon the quantity present in the material, inhalation or ingestion of lead particles may result in lead-induced systemic toxicity. Symptoms of lead poisoning include abdominal cramps, anemia, muscle weakness and headache.
- **Eye:** Excessive exposure to high concentrations of dust may cause irritation to the eyes. Particles of iron or iron compounds, which become imbedded in the eye, may cause rust stains unless removed fairly promptly. Torching or burning operations on steel products with surface treatments, oil coatings, or acrylic films may produce emissions that can be irritating to the eyes.
- **Skin:** Skin contact with dusts may cause irritation or sensitization, possibly leading to dermatitis. Repeated or prolonged contact with chemical surface treatments or oil residue may cause skin irritation, dermatitis, ulceration or allergic reactions in sensitized individuals.
- **Ingestion:** Ingestion of harmful amounts of this product as distributed is unlikely due to its solid insoluble form. Ingestion of dust may cause nausea and/or vomiting.

Chronic Effects: Chronic inhalation of metallic fumes and dusts are associated with the following conditions:

- **IRON OXIDE:** Chronic inhalation of excessive concentrations of iron oxide fumes or dusts may result in the 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.
- **ALUMINUM:** Aluminum dusts/fines are a low health risk by inhalation and should be treated as a nuisance dust.
- **BORON:** Boron oxide dusts and fumes may cause upper respiratory tract and eye irritation, dryness of the mouth, nose or throat, and sore throat and productive cough.
- **CARBON:** Chronic inhalation of high concentrations to carbon may cause pulmonary disorders.

- **MANGANESE:** Chronic exposure to high concentrations of manganese fumes and dusts may adversely affect the central nervous system with symptoms including languor, sleepiness, weakness, emotional disturbances, spastic gait, mask-like facial expression and paralysis. Animal studies indicate that manganese exposure may increase susceptibility to bacterial and viral infections.
- **PHOSPHOROUS:** Inhalation of dusts and fumes of ferrophosphorus and phosphorous oxides may cause respiratory irritation.
- **SULFUR:** Sulfur compounds, present in the fumes, may irritate the skin, eyes, lungs and gastrointestinal tract.
- **ZINC:** Latent liver dysfunction and gastrointestinal disturbances with pressure in the stomach region, nausea, and weakness have been reported from repeated inhalation zinc oxide. Repeated or prolonged skin contact to zinc oxide, coupled with poor personal hygiene, may result in "oxide pox" due to clogging of sebaceous glands. "Oxide pox", especially localized to moist areas, is characterized by small red, hard projecting papules with a central white plug, which develops into a pustule with intense itching. The lesions usually clear within 7-10 days. Repeated or prolonged eye contact with zinc oxide fume may produce conjunctivitis.

Long-term inhalation exposure to high concentrations (over-exposure) to pneumoconiotic agents may act synergistically with inhalation of oxides, fumes or dusts of this product to cause toxic effects.

Chemical Surface Treatments/Coatings: The possible presence of oil coatings should be considered when evaluating potential employee health hazards and exposures during handling and welding or other fume generating activities. Removal of surface coatings should be considered prior to such activities. Repeated or prolonged contact with oil residue may cause skin irritation, dermatitis or allergic reactions in sensitized individuals. Torch or burning operations on steel products with oil coatings may produce emissions that can be irritating to the eyes and respiratory tract.

Carcinogenicity: The international Agency for Research on Cancer (IARC), the National Toxicology Program (NTP), and OSHA do not list steel products as carcinogens. IARC identifies welding fumes as a Group 2B carcinogen, a mixture that is possibly carcinogenic to humans.

Medical Conditions Aggravated by Long-Term Exposure: Individuals with chronic respiratory disorders (i.e., asthma, chronic bronchitis, emphysema, etc.) may be adversely affected by any fume or airborne particulate matter exposure.

SARA Potential Hazard Categories: Immediate Acute Health Hazard; Delayed Chronic Health Hazard.

Section 4 - First Aid Measures

Inhalation: For over-exposure to airborne fumes and particulate, remove exposed person to fresh air. If breathing is difficult or has stopped, administer artificial respiration or oxygen as indicated. Seek medical attention promptly. Metal fume fever may be treated by bed rest, and administering a pain and fever reducing medication.

Eye Contact: Flush with large amounts of clean water to remove particles. Seek medical attention if irritation persists.

Skin Contact: Remove contaminated clothing. Wash affected areas with soap or mild detergent and water. If thermal burn has occurred, flush area with cold water and seek medical attention. If a persistent rash or irritation occurs, seek medical attention.

Ingestion: Not a probable route of industrial exposure. However, if ingested, seek medical attention immediately.

Section 5 - Fire-Fighting Measures

Flash Point: Not applicable

LEL: Not applicable

Flash Point Method: Not applicable

UEL: Not applicable

Burning Rate: Not applicable

Auto-ignition Temperature: Not applicable

Flammability Classification: Non-flammable, non-combustible

Extinguishing Media: Not applicable for solid product. Use extinguishers appropriate for surrounding materials.

Unusual Fire or Explosion Hazards: Not applicable for solid product. Do not use water on molten metal.

Hazardous Combustion Products: At temperatures above the melting point, fumes containing metal oxides and other alloying elements may be liberated.

Fire-Fighting Instructions: Do not release runoff from fire control methods to sewers or waterways.

Fire-Fighting Equipment: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode and full protective clothing.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: Not applicable to steel in solid state. For spills involving finely divided particles, clean-up personnel should be protected against contact with eyes and skin. If material is in a dry state, avoid inhalation of dust. Fine, dry material should be removed by vacuuming or wet sweeping methods to prevent spreading of dust. Avoid using compressed air. Do not release into sewers or waterways. Collect material in appropriate, labeled containers for recovery or disposal in accordance with federal, state, and local regulations.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120) and all other pertinent state and federal requirements.

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

Section 7 - Handling and Storage

Handling Precautions: Operations with the potential for generating high concentrations of airborne particulates should be evaluated and controlled as necessary. Practice good housekeeping. Avoid breathing metal fumes and/or dust.
Storage Requirements: Store away from acids and incompatible materials.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use controls as appropriate to minimize exposure to metal fumes and dusts during handling operations.
Ventilation: Provide general or local exhaust ventilation systems to minimize airborne concentrations. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.
Administrative Controls: Do not use compressed air to clean-up spills.
Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen.
Protective Clothing/Equipment: For operations which result in elevating the temperature of the product to or above its melting point or result in the generation of airborne particulates, use protective clothing, gloves and safety glasses to prevent skin and eye contact. Contact lenses should not be worn where industrial exposures to this material are likely. Use safety glasses or goggles as required for welding, burning, sawing, brazing, grinding or machining operations. Protective gloves should be worn as required for welding, burning or handling operations. Where the surface treatments are applied to the product, wear gloves when handling. Do not continue to use gloves or work clothing that has become saturated or soaked through with oil coating. Wash skin that has been exposed to oil with soap and water or waterless hand cleaner.

Section 9 - Physical and Chemical Properties

Physical State: Solid	Water Solubility: Insoluble
Appearance and Odor: Metallic Gray, Odorless	Other Solubilities: Not applicable
Odor Threshold: Not applicable	Boiling Point: Not applicable
Vapor Pressure: Not applicable	Viscosity: Not applicable
Vapor Density (Air=1): Not applicable	Refractive Index: Not applicable
Formula Weight: Not applicable	Surface Tension: Not applicable
Density: 7.85 g/cc	% Volatile: Not applicable
Specific Gravity (H₂O=1, at 4 °C): 7.85	Evaporation Rate: Not applicable
pH: Not applicable	Freezing/Melting Point: Base Metal – 2750 °F Metallic Coating – 800-900 °F

Section 10 - Stability and Reactivity

Stability: Steel products are stable under normal storage and handling conditions.
Polymerization: Hazardous polymerization cannot occur.
Chemical Incompatibilities: Will react with strong acids to form hydrogen. Iron oxide dusts in contact with calcium hypochlorite evolve oxygen and may cause an explosion.
Conditions to Avoid: Storage with strong acids or calcium hypochlorite
Hazardous Decomposition Products: Thermal oxidative decomposition of galvanized steel products can produce fumes containing oxides of zinc, iron and manganese as well as other alloying elements.

Section 11 - Toxicological Information

No information is available for galvanized steel as a mixture. The possible presence of chemical surface treatments and oil coatings should be considered when evaluating potential employee health hazards and exposures during handling and welding or other fume generating activities.

Eye Effects:

Eye contact with the individual components may cause particulate irritation. Implantation of iron particles in guinea pig corneas has resulted in rust rings with corneal softening about rust ring. Repeated or prolonged eye contact with zinc oxide fume may produce conjunctivitis.

Skin Effects:

Skin contact with the individual dust components may cause physical abrasion, irritation and dermatitis.

Toxicity Data: *

Acute Inhalation Effects:

Inhalation of the individual alloy components has been shown to cause various respiratory effects.

Acute Oral Effects:

No data available

Other: No LC50 or LD50 has been established for the mixture as a whole.

Iron LD50: 30 g/kg oral (rat). Aluminum LD50: No data. Boron LD50: 2000 mg/kg oral (mouse). Carbon LD50: No data. Manganese LD50: 9 g/kg oral (rat). Phosphorous LD50: No data. Sulfur LD: >8437 mg/kg oral (rat). Antimony LD50: No data. Lead TD_{Lo}: 450 mg/kg/6 yrs. oral (human). Zinc TC_{Lo}: 124 mg/m³/50 min. inhalation (human).

Chronic Effects: See Section 3.

Carcinogenicity: See Section 3.

Mutagenicity: No data available

Teratogenicity: No data available

* See NIOSH, *RTECS*: (NO4565500) for additional toxicity data on iron; (BD0330000) for aluminum; (ED7350000) for boron, (FF5250000) for carbon; (OO9275000) for manganese; (WS4250000) for sulfur; (ZG8600000) for zinc.

Section 12 - Ecological Information

Ecotoxicity: No data available for galvanized steel products as a whole. However, individual components have been found to be toxic to the environment. Metal dusts may migrate into soil and groundwater and be ingested by wildlife. Lead can be bioaccumulated in plants and water organisms, especially shellfish.

Environmental Fate: No data available.

Environmental Degradation: No data available.

Soil Absorption/Mobility: No data available for galvanized steel products as a whole. However, individual components have been found to be absorbed by plants from soil.

Section 13 - Disposal Considerations

Disposal: Steel scrap should be recycled whenever possible. Product dusts and fumes from processing operations should also be recycled, or classified by a competent environmental professional and disposed of in accordance with applicable federal, state or local regulations.

Container Cleaning and Disposal: Follow applicable Federal, state and local regulations. Observe safe handling precautions.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Electrolytic galvanized steel is not listed as a hazardous substance under 49 CFR 172.101.

Shipping Name: Not applicable

Shipping Symbols: Not applicable

Hazard Class: Not applicable

ID No.: Not applicable

Packing Group: Not applicable

Label: Not applicable

Special Provisions (172.102): None

Packaging Authorizations

a) **Exceptions:** None

b) **Non-bulk Packaging:** Not applicable

c) **Bulk Packaging:** Not applicable

Quantity Limitations

a) **Passenger, Aircraft, or Railcar:** Not applicable

b) **Cargo Aircraft Only:** Not applicable

Vessel Stowage Requirements

a) **Vessel Stowage:** Not applicable

b) **Other:** Not applicable

Section 15 - Regulatory Information

Regulatory Information: *The following listing of regulations relating to a United States Steel Corporation product may not be complete and should not be solely relied upon for all regulatory compliance responsibilities.*

This product and/or its constituents are subject to the following regulations:

OSHA Regulations:

Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A): The product as a whole is not listed. However, individual components of the product are listed.

EPA Regulations:

RCRA (40CFR261): Steel scrap is not regulated as a solid waste or a hazardous waste under this act. If product dusts and/or fumes from processing operations are not recycled, they are considered to be a solid waste and may be classified as a hazardous waste depending on the toxicity characteristics of the dust as defined within 40CFR261.24.

CERCLA Hazardous Substance (40 CFR 302.4): The product as a whole is not listed. Manganese compounds are also listed although no reportable quantity is assigned to this generic or broad class.

SARA 311/312 Codes (40CFR370): Immediate (acute) health hazard and delayed (chronic) health hazard.

SARA 313 (40CFR372.65): Manganese and Zinc are subject to SARA 313 reporting requirements. Please note that if you prepackage or redistribute this product to industrial customers, SARA 313 requires that a notice be sent to those customers.

State Regulations: The product as a whole is not listed in any state regulations. However, individual components of the product are listed in various state regulations.

Pennsylvania Right to Know: Contains regulated material in the following categories:

- Hazardous Substances: Sulfur.
- Environmental Hazards: Aluminum, Manganese and Zinc

New Jersey Right to Know: Contains regulated material in the following categories:

- Hazardous Substance: Aluminum (dust and fume) and Manganese.

California Prop. 65: The product may possibly contain trace quantities (generally much less than 0.1%) of metallic elements known to the State of California to cause cancer or reproductive toxicity. These include arsenic (inorganic), cadmium, lead and nickel.

Other Regulations: The product as a whole is not listed in any state regulations. However, individual components of the product are listed in various state regulations.

WHMIS Classification (Canadian): D-2

Section 16 - Other Information

Prepared By: United States Steel Corporation

Hazard Rating Systems:

NFPA Code: 1-0-0

HMIS Code: 1*-0-0 PPE: See Section 8 * Denotes possible chronic hazard if airborne dusts or fumes are generated.

Disclaimer: All information, recommendations, and suggestions appearing herein concerning this product are taken from sources or based upon data believed to be reliable. Although reasonable care has been taken in the preparation of this information, United States Steel Corporation extends no warranties or guarantees, express or implied, makes no representations, and assumes no responsibility as to the accuracy, reliability or completeness of the information presented. Since the actual use of the product described herein is beyond our control, United States Steel Corporation assumes no liability arising out of the use of the product by others. It is the user's responsibility to determine the suitability of the information presented herein, to assess the safety and toxicity of the product under their own conditions of use, and to comply with all applicable laws and regulations. Appropriate warnings and safe handling procedures should be provided to handlers and users.

HAZARDOUS COMMUNICATION LABEL**CARBON STEEL-METALLIC COATING**

WARNING! EXPOSURE TO HIGH CONCENTRATIONS OF DUST OR FUME DURING WELDING, BURNING, MELTING, CUTTING, BRAZING, GRINDING AND POSSIBLY MACHINING, ETC., MAY PRODUCE IMMEDIATE OR DELAYED DAMAGE TO LUNGS OR OTHER ORGANS.

EXCESSIVE INHALATION OF ZINC OXIDE FUMES CAN PRODUCE AN ACUTE REACTION KNOWN AS "METAL FUME FEVER", WITH FLU-LIKE SYMPTOMS LASTING FROM 12 TO 48 HOURS.

THIS PRODUCT MAY BE COATED WITH MATERIALS THAT COULD RESULT IN SKIN IRRITATION WITH PROLONGED CONTACT.

PRECAUTIONS: AVOID BREATHING OR INGESTING DUST OR FUME. ADEQUATE VENTILATION IS REQUIRED WHILE WELDING, BURNING, MELTING, CUTTING, BRAZING, GRINDING AND MACHINING.

AVOID SKIN CONTACT IF MATERIAL IS COATED.

FIRST AID: FOR OVEREXPOSURE TO AIRBORNE DUST AND FUME, REMOVE EXPOSED PERSON TO FRESH AIR. IF BREATHING IS DIFFICULT OR HAS STOPPED, ADMINISTER ARTIFICIAL RESPIRATION OR OXYGEN AS INDICATED. SEEK MEDICAL ATTENTION PROMPTLY.

IF PRODUCT IS COATED AND EXCESSIVE SKIN CONTACT OCCURS, WASH WITH SOAP AND WATER. IF IRRITATION DEVELOPS, SEEK MEDICAL ATTENTION.

ADDITIONAL INFORMATION: REFER TO MATERIAL SAFETY DATA SHEETS USS CODE NOS. 3C013, 3C016, FOR FURTHER INFORMATION ON SPECIFIC PRODUCTS.

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