



## United States Steel Corporation

### Material Safety Data Sheet

USS Code Number: 1C001

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Revised: 06/04

#### Section 1 - Chemical Product and Company Identification

**Product/Chemical Name:** Slabs, Blooms, Ingots, Tube Rounds – Carbon Steel  
**Common Name:** Semi-Finished Carbon Steel

**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 <sup>1</sup>	ACGIH TLV <sup>2</sup>
<b>Base Metal</b>				
Iron	7439-89-6	>96	10 mg/m <sup>3</sup> - Iron oxide fume	5 mg/m <sup>3</sup> - Iron oxide dust and fume
<b>Alloying Elements</b>				
Aluminum	7429-90-5	0.10 max.	15 mg/m <sup>3</sup> - Total dust 5 mg/m <sup>3</sup> - Respirable fraction	10 mg/m <sup>3</sup> - Metal Dust 5 mg/m <sup>3</sup> - Welding fume
Boron	7440-42-8	0.006 max.	15 mg/m <sup>3</sup> - Total dust (as Boron oxide)	10 mg/m <sup>3</sup> - Boron oxide
Calcium	7440-70-2	0.10 max.	5 mg/m <sup>3</sup> - Calcium oxide	2 mg/m <sup>3</sup> - Calcium oxide
Carbon	7440-44-0	0.70 max.	15 mg/m <sup>3</sup> - Total dust (PNOR) <sup>3</sup> 5 mg/m <sup>3</sup> - Respirable fraction (PNOR)	10 mg/m <sup>3</sup> - Inhalable fraction <sup>4</sup> (PNOS) <sup>3</sup> 3 mg/m <sup>3</sup> - Respirable fraction <sup>4</sup> (PNOS)
Copper	7440-50-8	0.60 max.	0.1 mg/m <sup>3</sup> - Fume (as Cu) 1 mg/m <sup>3</sup> - Dusts & mists (as Cu)	0.2 mg/m <sup>3</sup> - Fume 1 mg/m <sup>3</sup> - Dusts & mists (as Cu)
Manganese	7439-96-5	1.65 max.	5 mg/m <sup>3</sup> (C) - Fume & Mn compounds	0.2 mg/m <sup>3</sup>
Phosphorus	8049-19-2	0.15 max.	15 mg/m <sup>3</sup> - Total dust (PNOR) 5 mg/m <sup>3</sup> - Respirable fraction (PNOR)	10 mg/m <sup>3</sup> - Inhalable fraction (PNOS) 3 mg/m <sup>3</sup> - Respirable fraction (PNOS)
Silicon	7440-21-3	0.60 max.	15 mg/m <sup>3</sup> - Total dust 5 mg/m <sup>3</sup> - Respirable fraction	10 mg/m <sup>3</sup>
Sulfur	7704-34-9	0.30 max.	15 mg/m <sup>3</sup> - Total dust (PNOR) 5 mg/m <sup>3</sup> - Respirable fraction (PNOR)	10 mg/m <sup>3</sup> - Inhalable fraction (PNOS) 3 mg/m <sup>3</sup> - Respirable fraction (PNOS)

#### Notes:

- 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.

<sup>1</sup> 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.

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

<sup>3</sup> 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/m<sup>3</sup> for total dust and 5 mg/m<sup>3</sup> for the respirable fraction.

<sup>4</sup> 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.

<sup>5</sup> 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/m<sup>3</sup> for inhalable particulate and 3 mg/m<sup>3</sup> for respirable particulate has been recommended.

<sup>6</sup> 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. 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 copper have been associated with causing metal fume fever.
- **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 oil coatings 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 oil residue may cause skin irritation, dermatitis 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 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.
- **CALCIUM:** Depending on the concentration and duration of exposure, repeated or prolonged inhalation may cause inflammation of the respiratory passages, ulcers of the mucous membranes, and possible perforation of the nasal septum. Repeated or prolonged skin contact may cause dermatitis.
- **CARBON:** Chronic inhalation of high concentrations to carbon may cause pulmonary disorders.
- **COPPER:** Chronic exposure to copper dusts may result in runny nose, irritation of mucous membranes, and atrophic changes with resultant dementia. Chronic inhalation of copper dust has caused, in animals, hemolysis of the red blood cells, deposition of hemofuscin in the liver and pancreas, injury to lung cells and gastrointestinal symptoms.

- **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.
- **SILICON:** Silicon dusts are a low health risk by inhalation and should be treated as a nuisance dust.
- **SULFUR:** Sulfur compounds, present in the fumes, may irritate the skin, eyes, lungs and gastrointestinal tract.

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.

**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 mechanical abrasion has occurred, 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.

**Section 9 - Physical and Chemical Properties**

**Physical State:** Solid

**Appearance and Odor:** Metallic Gray, Odorless

**Odor Threshold:** Not applicable

**Vapor Pressure:** Not applicable

**Vapor Density (Air=1):** Not applicable

**Formula Weight:** Not applicable

**Density:** 7.85 gm/cc

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 7.85

**pH:** Not applicable

**Water Solubility:** Insoluble

**Other Solubilities:** Not applicable

**Boiling Point:** Not applicable

**Viscosity:** Not applicable

**Refractive Index:** Not applicable

**Surface Tension:** Not applicable

**% Volatile:** Not applicable

**Evaporation Rate:** Not applicable

**Freezing/Melting Point:** ~2750 °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 steel products can produce fumes containing oxides of iron and manganese as well as other alloying elements.

**Section 11 - Toxicological Information**

No information is available for the product as a mixture.

**Eye Effects:**

Eye contact with the individual components may cause particulate irritation. Implantation of iron particles in guinea pig corneas have resulted in rust rings with corneal softening about rust ring.

**Skin Effects:**

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

**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). Calcium LD50: No data. Carbon LD50: No data.

Copper TD<sub>Lo</sub>: 120 ug/kg oral (human). Manganese LD50: 9 g/kg oral (rat).

Phosphorous LD50: No data. Silicon LD50: 3160 mg/kg oral (rat). Sulfur

LD50: >8437 mg/kg oral (rat).

**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, (EV8040000) for calcium, (FF5250100) for carbon, (GL5325000) for copper, (OO9275000) for manganese, (VW0400000) for silicon, (WS4250000) for sulfur.

**Section 12 - Ecological Information**

**Ecotoxicity:** No data available for the product as a whole. However, individual components of the product have been found to be toxic to the environment. Metal dusts may migrate into soil and groundwater and be ingested by wildlife.

**Environmental Fate:** No data available.

**Environmental Degradation:** No data available.

**Soil Absorption/Mobility:** No data available for the product as a whole. However, individual components of the product 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):**

Semi-finished steel products are not listed as hazardous substances 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. However, individual components of the product are listed: Copper (Reportable Quantity (RQ)-5000#). 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 is 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: Calcium, Silicon and Sulfur.
- Environmental Hazards: Aluminum, Copper and Manganese.

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

- Hazardous Substance: Aluminum (dust and fume), Copper, Manganese and Sulfur.
- Special Health Hazard Substances: Calcium.

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: 0-0-0

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**

**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.

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. 1C001, 1C004, 2C008, 2C009, 2C010, 3C011, 3C017, 4C018, 4C019, 4C020 FOR FURTHER INFORMATION ON SPECIFIC PRODUCTS.

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