Material Safety Data Sheet

Section 1 - Chemical Product and Company Identification

Product/Chemical Name: Blast Furnace Iron

Reference Number: 013

Synonyms: Molten Iron, Blast Furnace Hot Metal, Pig Iron, Cold Iron, Cast Iron

CAS Number: Mixture

Manufacturer: Mittal Steel USA Inc.
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CHEMTREC (Day or Night) 1-800-424-9300

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Section 2 - Composition / Information on Ingredients

Ingredient Name	CAS Number	Percentage by wt.	OSHA PEL [1]	ACGIH TLV [2]
Iron	7439-89-6	93 – 94	10 mg/m³ - Iron oxide fume	5 mg/m³ - Iron oxide dust and fume
Carbon	7440-44-0	4 – 5.5	15 mg/m³ -Total dust (PNOR) [3] 5 mg/m³ - Respirable fraction[6] (PNOR)	10 mg/m³ - Inhalable fraction[4] (PNOS) [5] 3 mg/m³ - Respirable fraction (PNOS)
Manganese	7439-96-5	0.2 – 1.0	5 mg/m³ (C) - Fume & Mn compounds	0.2 mg/m³
Phosphorus	7723-14-0	0.04 – 0.2	0.1 mg/m³	0.1 mg/m³
Silicon	7440-21-3	0.1 – 4.0	15 mg/m³ - Total dust 5 mg/m³ - Respirable fraction	10 mg/m³
Sulfur	7704-34-9	0.02 – 0.3	15 mg/m³ - Total dust (PNOR) 5 mg/m³ - Respirable fraction (PNOR)	10 mg/m³ - Inhalable fraction (PNOS) 3 mg/m³ - Respirable fraction (PNOS)

Notes:

- All commercial steel products contain small amounts of various elements in addition to those specified. These small quantities frequently referred to as “trace” or “residual” elements, generally originate in the raw materials used. Individual trace elements vary in concentration by weight, and may include antimony, arsenic, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, 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/m^3 for total dust and 5 mg/m^3 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/m^3 for inhalable particulate and 3 mg/m^3 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 molten metal product poses a significant and immediate burn and fire hazard. Potentially hazardous quantities of airborne particulate and fume may be generated. These operations should be performed in well-ventilated areas. Avoid inhalation of metal dusts and fumes. Iron foreign bodies imbedded in the cornea of the eye will produce rust stains unless removed fairly promptly. If appropriate, respiratory protection and other personal protective equipment should be used.

Potential Health Effects

Primary Entry Routes: Inhalation and skin. Iron in the molten state presents an inhalation and contact hazard and 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/fume 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 have been associated with causing metal fume fever. Sulfur compounds, present in generated fumes, may irritate the respiratory or gastrointestinal tract. Phosphorus oxide compounds are respiratory tract irritants.
- **Eye:** Contact with molten metal will cause severe burns and blindness. Particles of iron or iron compounds, which become imbedded in the eye, may cause irritation to the eyes. Sulfur compounds, present in generated fumes, may irritate the eyes.
- **Skin:** Skin contact with molten metal will cause severe burns. Sulfur compounds, present in generated fumes, may irritate the skin.
- **Ingestion:** Ingestion of harmful amounts of molten iron is unlikely, however it will cause severe burns. Ingestion of dust/fume 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. Inhalation of excessive concentrations of ferric oxide may enhance the risk of lung cancer development in workers exposed to pulmonary carcinogens. Iron oxide is listed as a Group 3 (not classifiable) carcinogen by IARC.
- 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 phosphorous oxides may cause respiratory irritation.
- SILICON: Silicon dusts are a low health risk by inhalation and should be treated as a nuisance dust. Eye contact with pure material can cause particulate irritation. Skin contact with silicon dusts may cause physical abrasion.
- 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: IARC, NTP, and OSHA do not list blast furnace iron or any of its constituents as a carcinogen.

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.

Eye Contact: Flush with large amounts of clean water to remove particles. Seek medical attention if irritation persists. If thermal burn has occurred, flush area with cold water and seek medical attention.

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.

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:. Molten metal may react violently with water. Use extinguishers appropriate for surrounding materials.

Unusual Fire or Explosion Hazards: Avoid having molten iron run onto or trap water under molten iron. Sudden violent release of steam and gases can occur when water is trapped under molten iron.

Hazardous Combustion Products: 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 iron in solid state. For spills involving molten iron, personnel should be protected against contact with eyes and skin and avoid inhalation of dust/fume. Fine, dry material should be removed by vacuuming or wet sweeping methods to prevent spreading of dust. 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: Any excess product can be recycled for further use, disposed in an appropriately permitted waste landfill, or disposed by other methods, which are in accordance with local, state, and federal 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. Avoid contact with molten iron.

Storage Requirements: Store away from incompatible materials.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use controls as appropriate to minimize exposure to metal fumes/dusts and heat 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: No Data Supplied.

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 molten iron or the generation of airborne particulates, use protective clothing (flame retardant–molten), gloves (aluminized-molten) and safety glasses to prevent skin and eye contact as required. Contact lenses should not be worn where industrial exposures to this material are likely. Wash skin that has been exposed with soap and water or waterless hand cleaner.

Section 9 - Physical and Chemical Properties

Physical State: Molten (>2800 F)

Appearance and Odor: Greyish as solid/Orange as molten

Odor Threshold: Not applicable

Vapor Pressure: Not applicable

Vapor Density (Air=1) : Not applicable

Formula Weight: No Data Supplied

Density: 7.85

Specific Gravity (H_2O=1, at 4 °C): 7.0

pH: Not applicable

Water Solubility: Insoluble

Other Solubilities: Not applicable

Boiling Point: 5000 degrees F

Viscosity: No Data Supplied

Refractive Index: No Data Supplied

Surface Tension: No Data Supplied

% Volatile: Not applicable

Evaporation Rate: Not applicable

Freezing/Melting Point: No Data Supplied

Section 10 - Stability and Reactivity

Stability: Molten iron is stable under normal storage and handling conditions.

Polymerization: Hazardous polymerization cannot occur.

Chemical Incompatibilities: Encapsulating water with molten iron may cause an explosion.

Conditions to Avoid: Water when iron is in molten state.

Hazardous Decomposition Products: Thermal oxidative decomposition can produce fumes containing oxides of iron and manganese as well as other elements.

Section 11- Toxicological Information

No information is available for the product as a mixture.

Eye Effects:
Eye contact will cause burns and irritation and 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 components may cause burns, irritation, dermatitis, ulcerations and sensitizations.

Toxicity Data:*

Acute Inhalation Effects:
Inhalation of the individual components has been shown to cause various respiratory effects.

Acute Oral Effects:
No Data Supplied

Other: No LC50 or LD50 has been established for the mixture as a whole. Iron LD50: 30 g/kg oral (rat). Carbon LD50: No data. Manganese LD50: 9 g/kg oral (rat). Phosphorous LD50: No data. Silicon LD50: No data. Sulfur LD50: No data.

Chronic Effects: See section 3.

Carcinogenicity: No Data Supplied

Mutagenicity: No data available

Teratogenicity: No data available

- See NIOSH, *RTECS* (NO7400000), for additional toxicity data on iron oxide, (FF5250000) for carbon, (OO9275000) for manganese, (TH3500000) for phosphorous, (WM0400000) 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 Supplied.

Environmental Degradation: No Data Supplied.

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: This material is considered to be a solid waste, not a hazardous waste. Follow applicable Federal, state, and local regulations for disposal of solid waste and airborne particulates accumulated during handling operations of the product.

Disposal Regulatory Requirements: None

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

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Molten Iron is not listed as a hazardous substance under 49 CFR 172.101.

Shipping Name: Not applicable

Shipping Symbols: "HOT"

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 MITTAL STEEL USA Inc. 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: Not regulated.

CERCLA Hazardous Substance (40 CFR 302.4): The product as a whole is not listed. However, individual components of the product are listed: Manganese compounds and Phosphorous are listed under SARA 302.

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

SARA 313: Manganese and Phosphorous are subject to SARA 313 reporting requirements. Please also note that if you prepackage or otherwise redistribute this product to industrial customers, SARA 313 requires that a notice be sent to those customers.

Clean Water Act: Not regulated under Section 307 Priority Pollutants. Phosphorus is a Section 311 hazardous chemical.

Safe Drinking Water Act: Not regulated.

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: Silicon and Sulfur.
- Environmental Hazards: Manganese and Phosphorous.
- Special Hazard Substances: Not regulated

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

- Environmental Hazardous Substance: Manganese and Phosphorous
- Special Health Hazard Substances: Not regulated.

California Prop. 65: Not regulated.

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 (Canadian): D2B Product Classification.

Section 16 – Other Information

Prepared By: Mittal Steel USA Inc.

Hazard Rating Systems:

NFPA Code: 0-0-0 HMIS Code: 0-2-2 PPE: See Section 8

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