



United States Steel Corporation

Steel Furnace Slag Safety Data Sheet (SDS)

USS IHS Number: 7639

(Replaces USS Code Number: SRP-0003)

Locations: Fairfield, Gary, Granite City, Great Lakes, Hamilton, Lake Erie, and Mon Valley

Original: 12/16/2010

Revision: 12/31/2020

Section 1 – Identification

1(a) Product Identifier Used on Label: Steel Furnace Slag

1(b) Other Means of Identification: Basic Oxygen Furnace Slag, BOF Slag, BOP Slag, Q-BOP Slag, Steel Slag, Steelmaking Slag

1(c) Recommended Use of the Chemical and Restrictions on Use: Construction material, follow local use restrictions

1(d) Name, Address, and Telephone Number:

United States Steel Corporation Phone number: (412) 433-6840 (8:00 am to 5:00 pm)
600 Grant Street, Room 1662 FAX: (412) 433-5019
Pittsburgh, PA 15219-2800

1(e) Emergency Phone Number: 1-800-262-8200 (CHEMTREC)

Section 2 – Hazard(s) Identification

2(a) Classification of the chemical: Steel Furnace Slag is not considered hazardous under Reach regulation (REACH REGULATION (EC) No 1907/2006) and is not subject to classification under CLP regulation (REGULATION (EC) No 1272/2008). However, Steel Furnace Slag is hazardous under OSHA's Hazard Communication Standard (29 CFR 1910.1200). Therefore, the categories of Health Hazards as defined in "GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELLING OF CHEMICALS (GHS), Third revised edition ST/SG/AC.10/30/Rev. 3" United Nations, New York and Geneva, 2009 have been evaluated. Refer to Section 3, 8 and 11 for additional information.

2(b) Signal Word, Hazard Statement(s), Symbols and Precautionary Statement(s):

Hazard Symbol	Hazard Classification	Signal Word	Hazard Statement(s)
	Carcinogenicity - 1A	WARNING	May cause cancer.

Precautionary Statement(s):

Prevention	Response	Storage/Disposal
Wear protective gloves / protective clothing / eye protection / face protection. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood.	If exposed or concerned: Get medical advice/attention.	Dispose of contents in accordance with federal, state and local regulations. Store locked up.

2(c) Hazards Not Otherwise Classified: None Known

2(d) Unknown Acute Toxicity Statement (mixture): None Known

Section 3 – Composition/Information on Ingredients

3(a-c) Chemical Name, Common Name (Synonyms), CAS Number and Other Identifiers, and Concentration:

Chemical Name	CAS Number	EC Number	% weight
Slags, Steel Making	65996-71-6	266-004-1	100%
This product is a complex mixture of iron oxides, metallic silicates (iron, calcium, magnesium, and aluminum silicates), including: Dicalcium Silicate (Ca ₂ SiO ₄) 14284-23-2, Dicalcium Ferrite (Ca ₂ Fe ₂ O ₅) 12013-62-6, Merwinite (Ca ₃ MgSi ₂ O ₈) 13813-64-4, and Gehlenite (Ca ₂ Al ₂ SiO ₇) 1302-56-3, crystalline silica, magnesium oxide, manganese oxide, calcium oxide, phosphorous pentoxide, calcium flouride, and titanium dioxide. Listed below is a partial listing of the components that comprise this product:			
Manganese Oxide	1344-43-0	215-695-8	2-13

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Section 3 – Composition/Information on Ingredients (continued)

3(a-c) Chemical Name, Common Name (Synonyms), CAS Number and Other Identifiers, and Concentration (continued):

Chemical Name	CAS Number	EC Number	% weight
Iron Oxides	1345-25-1	215-721-8	10-33
	1309-38-2	215-169-8	
	1309-37-1	215-168-2	
Magnesium Oxide	1309-48-4	215-171-9	0-20
Calcium Oxide	1305-78-8	215-138-9	0-10
Phosphorus Pentoxide	1314-56-3	215-236-1	0.2-3
Calcium Fluoride	7789-75-5	232-188-7	0-2
Crystalline Silica (as Quartz)	14808-60-7	238-878-4	0-2
Titanium Dioxide	13463-67-7	236-675-5	0-1

EC- European Community
CAS- Chemical Abstract Service

Section 4 – First-aid Measures

4(a) Description of Necessary Measures:

- **Inhalation:** If exposed or concerned: Get medical advice/attention.
- **Eye Contact:** If exposed or concerned: Get medical advice/attention.
- **Skin Contact:** If exposed or concerned: Get medical advice/attention.
- **Ingestion:** If exposed or concerned: Get medical advice/attention.

4(b) Most Important Symptoms/Effects, Acute and Delayed (Chronic):

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.
- **Eye:** Particles of iron or iron compounds may become imbedded in the eye. Excessive exposure to high concentrations of dust may cause irritation to the eyes.
- **Skin:** Skin contact with dusts may cause irritation, possibly leading to dermatitis. Skin contact with dusts may cause physical abrasion.
- **Ingestion:** Ingestion of dust may cause nausea and/or vomiting.

Chronic Effects:

Individuals with chronic respiratory disorders (i.e., asthma, chronic bronchitis, emphysema, etc.) may be adversely affected by any fume or airborne particulate matter exposure. Persons with pre-existing skin disorders may be more susceptible to dermatitis.

4(c) Immediate Medical Attention and Special Treatment: Treat symptomatically.

Section 5 – Fire-fighting Measures

5(a) Suitable (and unsuitable) Extinguishing Media: Use extinguishers appropriate for surrounding materials. Molten metal may react violently with water.

5(b) Specific Hazards Arising from the Chemical: Not applicable for solid product.

5(c) Special Protective Equipment and Precautions for Fire-fighters: Self-contained NIOSH approved respiratory protection and full protective clothing should be worn when fumes and/or smoke from fire are present. Heat and flames cause emittance of acrid smoke and fumes. Do not release runoff from fire control methods to sewers or waterways. Firefighters should wear full face-piece self-contained breathing apparatus and chemical protective clothing with thermal protection. Direct water stream will scatter and spread flames and, therefore, should not be used.

Section 6 - Accidental Release Measures

6(a) Personal Precautions, Protective Equipment and Emergency Procedures: Not applicable to **Steel Furnace Slag** in solid state. If material is in a dry state, avoid inhalation of dust. Personnel should be protected against contact with eyes and skin. 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.

6(b) Methods and Materials for Containment and Clean Up: Collect material in appropriate, labeled containers for recovery or disposal in accordance with federal, state, and local regulations. Follow applicable OSHA regulations (29 CFR 1910.120) and all other pertinent state and federal requirements.

Section 7 - Handling and Storage

7(a) Precautions for Safe Handling: Wear protective gloves / protective clothing / eye protection / face protection. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Emergency safety showers and eye wash stations should be present.

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Section 7 - Handling and Storage (continued)

7(b) Conditions for Safe Storage, including any Incompatibilities: Whenever feasible, store locked up.

Section 8 - Exposure Controls / Personal Protection

8(a) Occupational Exposure Limits (OELs): The following exposure limits is offered as reference, for an experience industrial hygienist to review.

Ingredients	OSHA PEL ¹	ACGIH TLV ²	NIOSH REL ³	IDLH ⁴
Metallic silicates*	NE	NE	NE	NE
Iron Oxides	10 mg/m ³ (iron oxide fume)	5.0 mg/m ³ (iron oxide, respirable fraction ⁵)	5.0 mg/m ³ (iron oxide dust and fume)	2,500 mg/m ³ (as Fe)
Manganese Oxide	“C” 5.0 mg/m ³ (as fume & inorganic compounds, as Mn)	0.02 mg/m ³ (as fume & inorganic compounds, as Mn, respirable fraction) 0.1 mg/m ³ (as fume & inorganic compounds, as Mn, inhalable fraction ⁶)	1.0 mg/m ³ (as fume & inorganic compounds, as Mn) “STEL” 3.0 mg/m ³ (as fume & inorganic compounds, as Mn)	500 mg/m ³ (as Mn)
Magnesium Oxide	15 mg/m ³ (as magnesium oxide fume, total particulate)	10 mg/m ³ (as magnesium oxide, inhalable fraction)	NE	750 mg/m ³ (as magnesium oxide fume)
Calcium Oxide	5.0 mg/m ³ (as calcium oxide) 15 mg/m ³ (as calcium hydroxide & calcium silicate, total dust) 5.0 mg/m ³ (as calcium hydroxide & calcium silicate, respirable fraction)	2.0 mg/m ³ (as calcium oxide) 5.0 mg/m ³ (as calcium hydroxide)	2.0 mg/m ³ (as calcium oxide) 5.0 mg/m ³ (as calcium hydroxide) 10 mg/m ³ (as calcium silicate, total dust) 5.0 mg/m ³ (as calcium hydroxide, respirable fraction)	25 mg/m ³ (as calcium oxide)
Phosphorus Pentoxide	NE	NE	NE	NE
Calcium Fluoride	2.5 mg/m ³ (as F)	2.5 mg/m ³ (as F)	2.5 mg/m ³ (as F)	NE
Crystalline Silica (as quartz)	0.05 mg/m ³ “AL” 0.025 mg/m ³	0.025 mg/m ³ (as respirable fraction)	0.05 mg/m ³ (as respirable dust), Ca	50 mg/m ³ (as quartz, Tripoli) 25 mg/m ³ (as cristobalite, tridymite), Ca
Titanium Dioxide	15 mg/m ³ (as TiO ₂ , total dust)	10 mg/m ³ (as TiO ₂)	LFC ⁷ (as TiO ₂)	5,000 mg/m ³ (as TiO ₂)

NE - None Established

*Varying metallic silicates may be present in varying forms.

- OSHA PELs (Permissible Exposure Limits) 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. An Action level (AL) is used by OSHA and NIOSH to express a health or physical hazard. They indicate the level of a harmful or toxic substance/activity, which requires medical surveillance, increased industrial hygiene monitoring, or biological monitoring. Action Levels are generally set at one half of the PEL but the actual level may vary from standard to standard. The intent is to identify a level at which the vast majority of randomly sampled exposures will be below the PEL.
- Threshold Limit Values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) are 8-hour TWA concentrations unless otherwise noted. ACGIH TLVs are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes. DSEN – May cause dermal sensitization. This notation is used to indicate the potential for dermal sensitization resulting from the interaction of an absorbed agent and ultraviolet light (i.e. photosensitization). RSEN – May cause respiratory sensitization.
- The National Institute for Occupational Safety and Health Recommended Exposure Limits (NIOSH-REL)- Compendium of Policy and Statements. NIOSH, Cincinnati, OH (1992). NIOSH is the federal agency designated to conduct research relative to occupational safety and health. As is the case with ACGIH TLVs, NIOSH RELs are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes.
- The “immediately dangerous to life or health air concentration values (IDLHs)” are used by NIOSH as part of the respirator selection criteria and were first developed in the mid-1970’s by NIOSH. The Documentation for Immediately Dangerous to Life or Health Concentrations (IDLHs) is a compilation of the rationale and sources of information used by NIOSH during the original determination of 387 IDLHs and their subsequent review and revision in 1994. Ca is designated as carcinogen.
- 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 ACGIH 2020 TLVs[®] and BEIs[®] Appendix D, paragraph C.
- 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 2017 TLVs[®] and BEIs[®] (Biological Exposure Indices) Appendix D, paragraph A.
- LFC – Lowest Feasible Concentration. Refer to Section 11, Toxicological Information (e).

8(b) Appropriate Engineering Controls: Local exhaust ventilation should be used to control the emission of air contaminants. General dilution ventilation may assist with the reduction of air contaminant concentrations. Emergency eye wash stations and deluge safety showers should be available in the work area.

8(c) Individual Protection Measures:

- Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, use only 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. Concentration in air of the various contaminants determines the extent of respiratory protection needed. Half-face, negative-pressure, air-purifying respirator equipped with P100 filter is acceptable for concentrations up to 10 times the exposure limit. Full-face, negative-pressure, air-purifying respirator equipped with P100 filter is acceptable for concentrations up to 50 times the exposure limit. Protection by air-purifying negative-pressure and powered air respirators is limited. Use a positive-pressure-demand, full-face, supplied air respirator or (continued)...

Section 8 - Exposure Controls / Personal Protection (continued)

8(c) Individual Protection Measures (continued):

Respiratory Protection (continued): ... self-contained breathing apparatus (SCBA) for concentrations above 50 times the exposure limit. If exposure is above the IDLH (Immediately dangerous to life or health) for any of the constituents, or there is a possibility of an uncontrolled release or exposure levels are unknown, then use a positive-demand, full-face, supplied air respirator with escape bottle or SCBA.

Warning! Air-purifying respirators both negative-pressure and powered-air do not protect workers in oxygen-deficient atmospheres.

- **Eyes:** Wear appropriate eye protection to prevent eye contact. Use safety glasses with side shields or chemical goggles.
- **Skin:** Persons handling this product should wear appropriate clothing to prevent skin contact. Wear protective gloves.
- **Other Protective Equipment:** An eyewash fountain and deluge shower should be readily available in the work area.

Section 9 - Physical and Chemical Properties

9(a) Appearance (physical state, color, etc.): Dark gray, rock-like	9(j) Upper/lower Flammability or Explosive Limits: NA
9(b) Odor: NA	9(k) Vapor Pressure: NA
9(c) Odor Threshold: NA	9(l) Vapor Density (Air = 1): NA
9(d) pH: NA	9(m) Relative Density: NA
9(e) Melting Point/Freezing Point: ND	9(n) Solubility(ies): ND
9(f) Initial Boiling Point and Boiling Range: NA	9(o) Partition Coefficient n-octanol/water: NA
9(g) Flash Point: NA	9(p) Auto-ignition Temperature: ND
9(h) Evaporation Rate: NA	9(q) Decomposition Temperature: ND
9(i) Flammability (solid, gas): Not flammable	9(r) Viscosity: ND


NA - Not Applicable
ND - Not Determined for product as a whole

Section 10 - Stability and Reactivity

- 10(a) Reactivity:** Not Determined (ND)
- 10(b) Chemical Stability:** Steel Furnace Slag is stable under normal storage and handling conditions.
- 10(c) Possibility of Hazardous Reaction:** None Known
- 10(d) Conditions to Avoid:** Storage with strong acids or calcium hypochlorite.
- 10(e) Incompatible Materials:** Iron oxide dusts in contact with calcium hypochlorite evolve oxygen and may cause an explosion.
- 10(f) Hazardous Decomposition Products:** Toxic fumes and vapors may be released at elevated temperatures.

Section 11 - Toxicological Information

11(a-e) Information on Toxicological Effects: The following toxicity data has been determined for **Steel Furnace Slag** by using the information available for its components applied to the guidance on the preparation of an SDS under the GHS requirements of OSHA and the EU CPL:

Hazard Classification	Hazard Category		Hazard Symbols	Signal Word	Hazard Statement
	EU	OSHA			
Carcinogenicity (covers Categories 1A, 1B and 2)	1A	1A ^g		Danger	May cause cancer.

* NR Not Rated - Available data does not meet criteria for classification.

The Toxicological data listed below is presented regardless to classification criteria. Individual hazard classification categories where the toxicological information has met or exceeded a classification criteria threshold are listed above.

- a. The following LC₅₀ or LD₅₀ has been established for **Steel Furnace Slag** and it's components:
- **Slags, Steel Making:** Rat LD₅₀ > 2000 mg/kg (3 rat studies with same results)
 - **Iron Oxide:** LD₅₀ = >10,000 mg/kg (Oral/ Rat)
 - **Manganese Oxide:** Mn single oral exposures, LD₅₀ ranged from 275 to 804 mg/kg body weight per day for manganese chloride in different rat strains.
 - **Phosphorus Pentoxide:** LD₅₀ = 1.2 mg/l (Inhalation/Rat)
 - **Calcium Oxide:** LD₅₀ = >500 mg/kg but < 2000 mg/kg (Oral/ Rat)
 - **Calcium Fluoride:** LD₅₀ = 4250 mg/kg (Oral/ Rat)
 - **Silicon Dioxide:** LD₅₀ > 15,000 mg/kg (Oral/Rat)
 - **Silica:** LD₅₀ = 500 mg/kg (Oral/ Rat)
 - **Titanium Dioxide:** LD₅₀ > 10,000 mg/kg (Oral/Rat); LC₅₀ > 6.82 mg/l (Inhalation/Rat)
- b. The following Skin (Dermal) Irritation data available for **Steel Furnace Slag** as a mixture and it's components:
- **Slags, Steel Making:** Rabbit not irritating.
 - **Iron Oxide:** Moderately irritating.
- c. The following Eye Irritation data available for **Steel Furnace Slag** as a mixture and it's components:
- **Slags, Steel Making:** Rabbit not irritating.
 - **Iron Oxide:** Severely irritating; may cause burns.
 - **Silicon Dioxide:** Crystalline silica may cause abrasion of the cornea.
 - **Magnesium Silicate:** Expected to be a minimal eye irritant.

Section 11 - Toxicological Information (continued)

11(a-e) Information on Toxicological Effects (continued):

- d. The following Skin (Dermal)/Respiratory Sensitization data available for **Steel Furnace Slag** as a mixture:
- **Slags, Steel Making:** Guinea Pig not sensitizing.
- e. No Aspiration Hazard data available for **Steel Furnace Slag** as a mixture or its individual components.
- f. No Germ Cell Mutagenicity data available for **Steel Furnace Slag** as a mixture. The following Germ Cell Mutagenicity information was found for the components:
- **Iron Oxide:** Both positive and negative data.
- g. Carcinogenicity: IARC, NTP, and OSHA do not list **Steel Furnace Slag** as carcinogens. The following Carcinogenicity information was found for the components:
- **Silicon Dioxide:** IARC-1 (silica, crystalline), carcinogen to humans; ACGIH TLV-A2 (silica, crystalline), suspected human carcinogen; NTP-K, known to be a carcinogen; NIOSH-Ca, potential occupational carcinogen; OSHA-Ca, carcinogen.
 - **Magnesium (oxide):** ACGIH TLV-A4, not classifiable as a human carcinogen
 - **Manganese (inorganic compounds, as Mn):** ACGIH TLV-A4, not classifiable as a human carcinogen; EPA-D, not classifiable as to human carcinogenicity (CBD, cannot be determined).
 - **Manganese (fume, as Mn):** EPA-D, not classifiable as to human carcinogenicity (CBD, cannot be determined).
 - **Titanium Dioxide:** IARC-2B, possibly carcinogenic to humans; ACGIH TLV-A4, not classifiable as a human carcinogen; NIOSH-Ca, potential occupational carcinogen.
 - **Iron Oxide (Fe₂O₃):** IARC-3, unclassifiable as to carcinogenicity in humans; ACGIH TLV-A4, not classifiable as a human carcinogen
- h. No Toxic Reproduction data available for **Steel Furnace Slag** as a mixture or its individual components.
- i. No Specific Target Organ Toxicity (STOT) following a Single Exposure data available for **Steel Furnace Slag** as a mixture. The following STOT following a Single Exposure data was found for the components:
- **Calcium Oxide:** Respiratory irritation from breathing fine particles in human subjects.
 - **Magnesium Oxide:** Slight respiratory tract irritation is expected with inhalation of powder.
 - **Phosphorus Pentoxide:** HSDB reports Phosphorus Pentoxide corrosive to respiratory and gastrointestinal tracts.
 - **Manganese Oxide:** CICAD reported Lung inflammation following single inhalation exposures to at 2.8-43 mg/m³ for manganese dioxide or manganese tetroxide particulates in rodent species.
 - **Silicon Dioxide:** Single exposure to very high airborne levels may cause lung irritation in exposed humans.
- j. No Specific Target Organ Toxicity (STOT) following Repeated Exposure data was available for **Steel Furnace Slag** as a whole. The following STOT following Repeated Exposure data was found for the components:
- **Manganese and Manganese Oxide:** CICAD listed as Category 1a, has found neurobehavioral alterations in worker populations with Mn and MnO including: speed and coordination of motor function are especially impaired.
 - **Manganese Oxide:** CICAD listed as Category 2, has found signs of lung inflammation in rhesus monkeys exposed via inhalation to 0.7mg/m³ manganese, as manganese dioxide for 22 hours per day over 10 months.
 - **Iron Oxide:** Some pulmonary and lung effects reported.
 - **Silicon Dioxide:** Repeated exposure to crystalline silica causes silicosis and kidney damage as well as increased incidence of autoimmune disorders in humans.
 - **Titanium Dioxide:** Inflammatory lesions in rat lungs produced by 3-month exposures to either 22.3 mg/m³ of ultrafine TiO₂; lesions "regressed" during a 1-year period following cessation of exposure.
 - **Calcium Fluoride:** Can cause damage to teeth and bones.

The above toxicity information was determined from available scientific sources to illustrate the prevailing posture of the scientific community. The scientific resources includes: The American Conference of Governmental Industrial Hygienist (ACGIH) Documentation of the Threshold Limit Values (TLVs) and Biological Exposure indices (BEIs) with Other Worldwide Occupational Exposure Values 2020, The International Agency for Research on Cancer (IARC), The National Toxicology Program (NTP) updated documentation, the World Health Organization (WHO) and other available resources, the International Uniform Chemical Information Database (IUCID), European Union Risk Assessment Report (EU-RAR), Concise International Chemical Assessment Documents (CICAD), European Union Scientific Committee for Occupational Exposure Limits (EU-SCOEL), Agency for Toxic Substances and Disease Registry (ATSDR), Hazardous Substance Data Bank (HSDB), and International Programme on Chemical Safety (IPCS).

The following health hazard information is provided regardless to classification criteria and is based on the individual component(s):

Acute Effects by Component:

- **METALLIC SILICATES:** Magnesium Silicate may irritate the eyes.
- **IRON OXIDE:** Iron is harmful if swallowed, causes skin irritation, and causes eye irritation. Contact with iron oxide has been reported to cause skin irritation and serious eye damage.
- **MANGANESE OXIDE:** Manganese oxide is harmful if swallowed.
- **MAGNESIUM OXIDE:** Headache, cough, sweating, nausea and fever may be caused by exposure to freshly formed fumes. The symptoms of metal fume fever do not become manifest until 4-12 hours after exposure.
- **CALCIUM OXIDE:** Calcium oxide is an eye and skin irritant.
- **PHOSPHOROUS PENTOXIDE:** Phosphorous pentoxide is harmful if inhaled, causes severe skin burns and eye damage.
- **CALCIUM FLUORIDE:** Slightly irritating to skin, moderately irritating to the eyes.
- **CRYSTALLINE SILICA (Silicon Dioxide):** Causes irritation and inflammation of the respiratory tract. May cause abrasion of the cornea. Inhalation may cause cough. A single exposure to very high airborne levels may cause lung irritation in exposed humans.
- **TITANIUM DIOXIDE:** Not Reported/ Not Classified

Section 11 - Toxicological Information (continued)

Delayed (chronic) Effects by Component:

- **METALLIC SILICATES:** Magnesium Silicate is suspected of causing cancer by inhalation. Lifetime inhalation exposure of rats and mice to atmospheres of magnesium silicate resulted in interstitial fibrosis of the lung and reduced pulmonary function in rats at $\geq 6 \text{ mg/m}^3$. Calcium Silicate exposure to Wollastonite miners suggests that occupational exposure can cause impaired respiratory function and pneumoconiosis.
- **IRON OXIDE:** Chronic inhalation of excessive concentrations of iron oxide fumes or dusts may result in the development of a benign lung disease, 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.
- **MANGANESE OXIDE:** 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. Worker populations exposed to MnO have had reports including: impairment of speed and coordination of motor function.
- **MAGNESIUM OXIDE:** Irritation of eyes, nose, and throat. Symptoms may include dryness of nose and mouth, cough, feeling of weakness, tightness of chest, muscular pain, chills, fever, headache, nausea, and vomiting.
- **CALCIUM OXIDE:** 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.
- **PHOSPHOROUS PENTOXIDE:** Inhalation of dusts and fumes of ferrophosphorus and phosphorous oxides may cause respiratory irritation. Phosphorus pentoxide is harmful if inhaled corrosive to eyes, skin, respiratory and gastrointestinal tracts.
- **CALCIUM FLUORIDE:** Repeated exposure to high concentrations of fluoride can cause damage to teeth and bones. Bone damage includes osteosclerosis and fluorosis.
- **CRYSTALLINE SILICA (Silicon Dioxide):** Chronic exposure can cause silicosis, a form of lung scarring that can cause shortness of breath, reduced lung function, and in severe cases, death. Repeated exposure may cause kidney damage as well as increased incidence of autoimmune disorder.
- **TITANIUM DIOXIDE:** There is no evidence of a health hazard from inhalation of titanium dioxide at airborne concentrations below 10 mg/m^3 . The toxicity of titanium dioxide has been found to be relatively inert. Eye contact with pure material can cause particulate irritation. Skin contact with titanium dusts may cause physical abrasion.

Section 12 - Ecological Information

12(a) Ecotoxicity (aquatic & terrestrial): No data available for the product, **Steel Furnace Slag** as a mixture. However, individual components of the product have been found to be toxic to the environment. Dusts may migrate into soil and groundwater and be ingested by wildlife as follows:

- **Iron Oxide:** LC₅₀: >1000 mg/L; Fish
- **Calcium Oxide:** LC₅₀: 159 mg/L; invertebrates
- **Calcium Fluoride:** LC₅₀: >200 mg/L; Fish, Invertebrates and Algae

12(b) Persistence & Degradability: No Data Available

12(c) Bioaccumulative Potential: No Data Available

12(d) Mobility (in soil): No Data Available

12(e) Other Adverse Effects: None Known

Additional Information:

Hazard Category: No Category

Signal Word: No Signal Word

Hazard Symbol: No Hazard Symbol

Hazard Statement: No Hazard Statement

Section 13 - Disposal Considerations

Disposal: Dispose of contents/container in accordance with local/regional/international regulations.

Container Cleaning and Disposal: Follow applicable federal, state and local regulations. Observe safe handling precautions. European Waste Catalogue 10-02-02 (unprocessed slag) or 10-02-99 (wastes not otherwise specified).

Please note this information is for Steel Furnace Slag in its original form. Any alterations can void this information.

Section 14 - Transport Information

14 (a-g) Transportation Information:

US Department of Transportation (DOT) under 49 CFR 172.101 does not regulate **Steel Furnace Slag** as a hazardous material. All federal, state, and local laws and regulations that apply to the transport of this type of material must be adhered to.

Shipping Name: Steel Furnace Slag Shipping Symbols: Not Applicable (NA) Hazard Class: NA UN No.: NA Packing Group: NA DOT/IMO Label: NA Special Provisions (172.102): NA	Packaging Authorizations a) Exceptions: NA b) Non-bulk: NA c) Bulk: NA	Quantity Limitations a) Passenger Aircraft or Rail: NA b) Cargo Aircraft Only: NA Vessel Stowage Location: NA DOT Reportable Quantities: NA
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Section 14 - Transport Information (continued)

International Maritime Dangerous Goods (IMDG) and the Regulations Concerning the International Carriage of Dangerous Goods by Rail (RID) classification, packaging and shipping requirements follow the US DOT Hazardous Materials Regulation.

Regulations Concerning the International Carriage of Dangerous Goods by Road (ADR) does not regulate **Steel Furnace Slag** as a hazardous material.

Shipping Name: Steel Furnace Slag Classification Code: NA UN No.: NA Packing Group: NA ADR Label: NA Special Provisions: NA Limited Quantities: NA	Packaging a) Packing Instructions: NA b) Special Packing Provisions: NA c) Mixed Packing Provisions: NA	Portable Tanks & Bulk Containers a) Instructions: NA b) Special Provisions: NA
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International Air Transport Association (IATA) does not regulate **Steel Furnace Slag** as a hazardous material.

Shipping Name: Steel Furnace Slag Class/Division: NA Hazard Label (s): NA UN No.: NA Packing Group: NA Excepted Quantities (EQ): NA	Passenger & Cargo Aircraft		Cargo Aircraft Only Pkg Inst: NA Max Net Qty/Pkg: NA	Special Provisions: NA ERG Code: NA
	Limited Quantity (EQ)			
	Pkg Inst: NA	Pkg Inst: NA		
	Max Net Qty/Pkg: NA	Max Net Qty/Pkg: NA		

Pkg Inst – Packing Instructions

Max Net Qty/Pkg – Maximum Net Quantity per Package

ERG – Emergency Response Drill Code

Steel Furnace Slag does not have a **Transport Dangerous Goods (TDG)** classification.

Section 15 - Regulatory Information

Regulatory Information: *The following listing of regulations relating to a U. S. Steel 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:

SARA Potential Hazard Categories: Immediate Acute Health Hazard, delayed Chronic Health Hazard

Section 313 Supplier Notification: This product contains the following toxic chemicals subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372:

CAS #	Chemical Name	Percent by Weight
1344-43-0	Manganese Oxide (Mn Compounds)	13 max

State Regulations: The product, **Steel Furnace Slag** as a mixture is not listed in any state regulations. However, individual components of the product are listed in various state regulations:

California Prop. 65: The product, **Steel Furnace Slag** can expose you to crystalline silica (airborne particles of respirable size only), which is known to the State of California to cause cancer, and no known reproductive toxicity. For more information go to www.P65Warnings.ca.gov.

Other Regulations:

WHMIS Classification (Canadian): The product, **Steel Furnace Slag** is not listed as a mixture. However individual components are listed.

Ingredients	WHMIS Classification
Silica Quartz	Carcinogenicity - Category 1A; Specific target organ toxicity - repeated exposure - Category 1
Titanium Dioxide	Carcinogenicity – Category 2
Calcium Oxide	Skin corrosion/irritation - Category 1; Serious eye damage/eye irritation - Category 1; Health hazards not otherwise classified (corrosion) - Category 1

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.

Section 16 - Other Information

Prepared By: United States Steel Corporation

Revision History:

Expiration Date: 12/31/2023

- 12/31/2020 – Update to sections 2, 8, 11, 15
- 08/15/2017 – Update WHMIS 2015
- 07/25/2014 - Update to OSHA HAZ COM 2012
- 06/28/2011 – Update of content and format to comply with GHS
- 11/25/1985 - Original Issue date

Steel Furnace Slag

USS IHS No.: 7639

Rev. 12/20

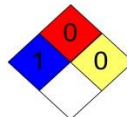
Section 16 - Other Information (continued)

Additional Information:

Hazardous Material Identification System (HMIS) Classification

Health Hazard	1
Fire Hazard	0
Physical Hazard	0

National Fire Protection Association (NFPA)



HEALTH= 1, * Denotes possible chronic hazard if airborne dusts or fumes are generated. Irritation or minor reversible injury possible.

FIRE= 0, Materials that will not burn.

PHYSICAL HAZARDS = 0, Materials that are normally stable, even under fire conditions, and will not react with water, polymerize, decompose, condense, or self-react. Non-explosives.

HEALTH = 1, Exposure could cause irritation but only minor residual injury even if no treatment is given.

FIRE = 0, Materials that will not burn.

INSTABILITY = 0, Normally stable, even under fire exposure conditions, and are not reactive with water.

ABBREVIATIONS/ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists
BEIs	Biological Exposure Indices
CAS	Chemical Abstracts Service
CECLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CNS	Central Nervous System
GI, GIT	Gastro-Intestinal, Gastro-Intestinal Tract
HMIS	Hazardous Materials Identification System
IARC	International Agency for Research on Cancer
LC50	Median Lethal Concentration
LD50	Median Lethal Dose
LD_{Lo}	Lowest Dose to have killed animals or humans
LEL	Lower Explosive Limit
µg/m³	microgram per cubic meter of air
mg/m³	milligram per cubic meter of air
mppcf	million particles per cubic foot
SDS	Safety Data Sheet
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association

NIF	No Information Found
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicology Program
ORC	Organization Resources Counselors
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PNOR	Particulate Not Otherwise Regulated
PNOC	Particulate Not Otherwise Classified
PPE	Personal Protective Equipment
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RTECS	Registry of Toxic Effects of Chemical Substances
SARA	Superfund Amendment and Reauthorization Act
SCBA	Self-contained Breathing Apparatus
STEL	Short-term Exposure Limit
TLV	Threshold Limit Value
TWA	Time-weighted Average
UEL	Upper Explosive Limit

Disclaimer: This information is taken from sources or based upon data believed to be reliable. However, United States Steel Corporation makes no warranty as to the absolute correctness or sufficiency of any of the foregoing or that additional or other measures may not be required under particular conditions.