



United States Steel Corporation

Iron Desulfurization Slag Fines

Safety Data Sheet (SDS)

USS IHS Number: 75372

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

Original: 12/16/2010

Revision: 11/06/20

Section 1 – Identification

1(a) Product Identifier used on Label: Iron Desulfurization Slag Fines

1(b) Other Means of Identification: Desulfurization Slag Fines, Desulf Fines, C-Kish, Kish C-Waste, CAS # 65996-69-2

1(c) Recommended use of the chemical and restrictions on use: None

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: Iron Desulfurization Slag Fines is considered a hazardous material according to the criteria specified in REACH [REGULATION (EC) No 1907/2006] and CLP [REGULATION (EC) No 1272/2008] and OSHA 29 CFR 1910.1200 Hazard Communication Standard. The categories of Health Hazards as defined in "GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELING 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) |
|---------------|--------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Single Target Organ Toxicity (STOT) Repeated Exposure - 1 | DANGER | Harmful if swallowed. May cause respiratory irritation. Causes eye irritation. Causes damage to lungs through prolonged or repeated exposure. Causes severe eye damage. Causes skin irritation. Harmful if swallowed. May cause respiratory irritation. |
| | Eye Irritation - 1 Skin Irritation - 2 | | |
| | STOT Single Exposure - 3 | | |

Precautionary Statement(s):

| Prevention | Response | Storage/Disposal |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Do not breathe dusts or fume. Wear protective gloves/ eye protection / face protection. Wash thoroughly after handling. Do not eat drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Get medical advice/attention if you feel unwell. | If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center or doctor/physician if you feel unwell. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician. If on skin: Wash with plenty of water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. | Store locked up. Dispose of contents in accordance with federal, state and local regulations. |

2(c) Hazards not Otherwise Classified: None Known

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

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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 |
|-----------------|------------|-----------|----------|
| Iron Oxides | 1345-25-1 | 215-721-8 | 27-46 |
| | 1309-37-1 | 215-168-2 | |
| Silica, Fused | 60676-86-0 | 262-373-8 | 17-32 |
| Calcium Oxide | 1305-78-8 | 215-138-9 | 20-22 |
| Magnesium Oxide | 1309-48-4 | 215-171-9 | 7-8 |
| Aluminum Oxide | 1344-28-1 | 215-691-6 | 3-6 |
| Manganese | 7439-96-5 | 231-105-1 | 0.9-2 |
| Carbon | 7440-44-0 | 231-153-3 | 1-2 |
| Sulfur | 7740-34-9 | 231-722-6 | 0.6-1 |

EC- European Community

CAS- Chemical Abstract Service

Section 4 – First-aid Measures

4(a) Description of Necessary Measures: Get medical advice/attention if you feel unwell.

- **Inhalation:** If Inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center or doctor/physician if you feel unwell.
- **Eye Contact:** If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician.
- **Skin Contact:** If on skin: Wash with plenty of water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse.
- **Ingestion:** Get medical advice/attention if you feel unwell.

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. 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. Excessive inhalation of calcium oxide dusts may cause severe irritation and burns of the 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 or sensitization, possibly leading to dermatitis. Skin contact with metallic fumes and 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: Steam, water fog, CO₂, foam, dry chemicals or sand. Small fires – Foam, CO₂, Dry Chemical, Water Spray. Large Fires – Water Spray, fog or foam.

5(b) Specific Hazards Arising from the Chemical: Incompatibility (materials to avoid) heat, and flames. When burned, toxic smoke and vapor may be emitted including, oxides of carbon, metal oxides and other toxic vapors.

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: 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.

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Section 6 - Accidental Release Measures (continued)

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: Wash thoroughly after handling. Do not breathe dusts or fume. Do not eat drink or smoke when using this product. Wear protective gloves / eye protection / face protection. Wash contaminated clothing before reuse. Use only outdoors or in a well-ventilated area. Avoid direct contact on skin, eyes or on clothing. Emergency safety showers and eye wash stations should be present.

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 are offered as reference, for an experience industrial hygienist to review.

| Ingredients | OSHA PEL ¹ | ACGIH TLV ² | NIOSH REL ³ | IDLH ⁴ |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| Iron and 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) |
| Silica, Fused | 80 mg/m ³ / % SiO ₂ (as SiO ₂) | NE | NE | NE |
| Calcium Oxide | 5.0 mg/m ³ (as calcium oxide) | 2.0 mg/m ³ (as calcium oxide) | 2.0 mg/m ³ (as calcium oxide) 10 mg/m ³ (as calcium silicate, total dust) | 25 mg/m ³ (as calcium oxide) |
| Magnesium Oxide | 15 mg/m ³ (as magnesium oxide fume, total particulate) | 10 mg/m ³ (as magnesium oxide, inhalable fraction ⁶) | NE | 750 mg/m ³ (as magnesium oxide fume) |
| Aluminum Oxide | 15 mg/m ³ (as aluminum oxide, metal & insoluble compounds, total dust) 5.0 mg/m ³ (as aluminum oxide, metal & insoluble compounds, respirable fraction) | 1.0 mg/m ³ (as metal & insoluble compounds, respirable fraction) | 10 mg/m ³ (as metal & insoluble compounds, total dust) 5.0 mg/m ³ (as metal & insoluble compounds, respirable fraction) | NE |
| Manganese | "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) | 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) |
| Carbon | NE | NE | NE | NE |
| Sulfur | NE | NE | NE | NE |

NE - None Established

- 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 2020 TLVs[®] and BEIs[®] (Biological Exposure Indices) Appendix D, paragraph A.

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 ...

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Section 8 - Exposure Controls / Personal Protection (continued)

8(c) Individual Protection Measures (continued):

- **Respiratory Protection (continued):** ... respirator and equipped with P100 filter is acceptable for concentrations up to 50 times the exposure limit. Protection by air-purifying negative-pressure powered air respirators is limited. Use a positive-pressure demand, full-face, supplied air respirator or 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 eye protection/face protection. For molten iron or the generation of airborne particulates, use safety glasses to prevent eye contact as required. A face shield should be used when appropriate to prevent contact with splashed materials.
- **Skin:** Wear protective gloves. For molten iron or the generation of airborne particulates, use protective clothing to prevent skin contact. Take off contaminated clothing and wash before reuse.
- **Other protective equipment:** An eyewash fountain and deluge shower should be readily available in the work area.

Section 9 - Physical and Chemical Properties

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

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:** Iron Desulfurization Slag Fines is stable under normal storage and handling conditions.
- 10(c) Possibility of Hazardous Reaction:** None Known
- 10(d) Conditions to Avoid:** Calcium oxide will react with water to form calcium hydroxide.
- 10(e) Incompatible Materials:** Iron oxide dusts in contact with calcium hypochlorite evolve oxygen and may cause an explosion.
- 10(f) Hazardous Decomposition Products:** Oxides of carbon, metal oxides and toxic vapors may be releases at elevated temperatures.

Section 11 - Toxicological Information

11(a-e) Information on Toxicological Effects: The following toxicity data has been determined for **Iron Desulfurization Slag Fines** 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 | | | |
| Skin Irritation (covers Categories 1A, 1B, 1C, and 2) | 2 | 2 ^b |  | Warning | Causes skin irritation. |
| Eye Damage/Irritation (covers Categories 1, 2A and 2B) | 1 | 1 ^c |  | Danger | Causes serious eye damage. |
| Specific Target Organ Toxicity (STOT) Following Single Exposure (covers Categories 1-3) | 3 | 3 ⁱ |  | Warning | May cause respiratory irritation. |
| STOT Following Repeated Exposure (covers Categories 1 and 2) | 2 | 1 ^j |  | Danger | Causes damage to lungs through prolonged or repeated exposure. |

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

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

Section 11 - Toxicological Information (continued)

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

- a. No LC₅₀ or LD₅₀ has been established for **Iron Desulfurization Slag Fines**. The following data has been determined for the components:
- **Iron Oxide:** LD₅₀ = >10,000 mg/kg (Oral/ Rat)
 - **Iron:** Rat LD₅₀ = 98.6 g/kg (REACH)
Rat LD₅₀ = 1060 mg/kg (IUCLID)
Rat LD₅₀ = 984 mg/kg (IUCLID)
Rabbit LD₅₀ = 890 mg/kg (IUCLID)
Guinea Pig LD₅₀ = 20 g/kg (TOXNET)
 - **Titanium Dioxide:** LD₅₀ > 10,000 mg/kg (Oral/Rat); LC₅₀ > 6.82 mg/l (Inhalation/Rat)
 - **Manganese:** Rat LD₅₀ > 2000 mg/kg (REACH)
Rat LD₅₀ > 9000 mg/kg (NLM Toxnet)
 - **Sulfur:** LD₅₀ = 2500 mg/kg (Oral/Rabbit)
- b. No Skin (Dermal) Irritation data available for **Iron Desulfurization Slag Fines** as a mixture. The following Skin (Dermal) Irritation data has been determined for the components:
- **Iron Oxide:** Moderately irritating.
 - **Magnesium Dioxide:** Severe skin irritant in human (HSDB).
 - **Sulfur:** Rabbit irritation, edema and erythema 4 at 72 hours all resolved by day 7 (REACH).
- c. No Eye Irritation data available for **Iron Desulfurization Slag Fines** as a mixture. The following Eye Irritation information was found for the components:
- **Iron Oxide:** Severely irritating; may cause burns. Human Corrosive (IUCLID).
 - **Iron:** Causes eye irritation.
 - **Calcium Oxide:** Rabbit Irritating (REACH).
 - **Magnesium dioxide:** Severe eye irritant in human (HSDB).
- d. No Skin (Dermal)/Respiratory Sensitization data available for **Iron Desulfurization Slag Fines** as a mixture or its individual components.
- e. No Aspiration Hazard data available for **Iron Desulfurization Slag Fines** as a mixture or its individual components.
- f. No Germ Cell Mutagenicity data available for **Iron Desulfurization Slag Fines** as a mixture. The following Germ Cell Mutagenicity information was found for the components:
- **Iron Oxide:** Both positive and negative data.
 - **Iron:** IUCLID has found some positive and negative findings in vitro.
- g. Carcinogenicity: IARC, NTP, and OSHA do not list **Iron Desulfurization Slag Fines** as carcinogens. The following Carcinogenicity information was found for the components:
- **Iron Oxide (Fe₂O₃):** IARC-3, unclassifiable as to carcinogenicity in humans; ACGIH TLV-A4, not classifiable as a human carcinogen
 - **Silica, fused:** IARC-3, unclassifiable as to carcinogenicity in humans
 - **Magnesium (oxide):** ACGIH TLV-A4, not classifiable as a human carcinogen
 - **Aluminum (metal and insoluble compounds):** IARC-1 (production), carcinogen to humans; 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).
- h. No Toxic Reproduction data available for **Iron Desulfurization Slag Fines** as a mixture or its individual components.
- i. No Specific Target Organ Toxicity (STOT) following a Single Exposure data available for **Iron Desulfurization Slag Fines** as a mixture. The following STOT following a Single Exposure data was found for the components:
- **Iron Oxide:** May cause lung irritation.
 - **Iron:** Irritating to respiratory tract.
 - **Calcium Oxide:** Can cause respiratory tract irritation, skin and eye irritation.
- j. No Specific Target Organ Toxicity (STOT) following Repeated Exposure data was available for **Iron Desulfurization Slag Fines** as a whole. The following STOT following Repeated Exposure data was found for the components:
- **Iron Oxide:** Some pulmonary and lung effects reported.
 - **Manganese:** Inhalation of metal fumes - Degenerative changes in human brain; Behavioral: Changes in motor activity and muscle weakness (Whitlock *et al.*, 1966).

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 (IUCLID), 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:

- **IRON AND 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.
- **AMORPHOUS SILICA (SILICON DIOXIDE):** Not Reported/ Not Classified
- **CALCIUM OXIDE:** Calcium oxide is an eye and skin irritant.

Section 11 - Toxicological Information (continued)

Acute Effects by Component (continued):

- **MAGNESIUM OXIDE:** Not Reported/ Not Classified
- **ALUMINUM OXIDE:** Inhalation may cause cough.
- **MANGANESE:** Manganese is harmful if swallowed.
- **CARBON:** Not Reported/ Not Classified
- **SULFUR:** Sulfur is harmful if swallowed, causes skin and eye irritation.

Delayed (chronic) Effects by Component:

- **IRON AND IRON OXIDES:** 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.
- **AMORPHOUS SILICA (SILICON DIOXIDE):** 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.
- **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.
- **ALUMINUM OXIDE:** Considered to be an inert or nuisance dust.
- **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.
- **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. Occupational overexposure (Manganese) is a progressive, disabling neurological syndrome that typically begins with relatively mild symptoms and evolves to include altered gait, fine tremor, and sometimes, psychiatric disturbances. May cause damage to lungs with repeated or prolonged exposure.
- **CARBON:** Chronic inhalation may lead to decreased pulmonary function.
- **SULFUR:** Sulfur compounds, present in the fumes, may irritate the skin, eyes, lungs and gastrointestinal tract. May cause damage to the lung from prolonged or repeated exposure, Sulfur dioxide vapor is irritating to the respiratory tract and can cause lung damage with repeated or prolonged exposure.

Section 12 - Ecological Information

12(a) Ecotoxicity (aquatic & terrestrial): No data available for the product, **Iron Desulfurization Slag Fines** as a whole. 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
- **Aluminum Oxide:** LC₅₀: >100 mg/L; Fish 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 (EWC): 10-02-99 (wastes not otherwise specified), 16-03-04 (inorganic wastes other than those mentioned in 16-03-03).

Please note this information is for Iron Desulfurization Slag Fines in its original form. Any alterations can void this information.

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Section 16 - Other Information

Prepared By: United States Steel Corporation

Revision History:

11/06/2020 – Update to sections 2, 8, 11, 15
 07/01/2017 – Update WHMIS 2015
 04/21/2014 - Update to OSHA HAZ COM 2012
 05/10/2011 – Original

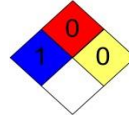
Expiration Date: 11/06/2023

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 | NIF | No Information Found |
| BEIs | Biological Exposure Indices | NIOSH | National Institute for Occupational Safety and Health |
| CAS | Chemical Abstracts Service | NTP | National Toxicology Program |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act | ORC | Organization Resources Counselors |
| CFR | Code of Federal Regulations | OSHA | Occupational Safety and Health Administration |
| CNS | Central Nervous System | PEL | Permissible Exposure Limit |
| GI, GIT | Gastro-Intestinal, Gastro-Intestinal Tract | PNOR | Particulate Not Otherwise Regulated |
| HMIS | Hazardous Materials Identification System | PNOC | Particulate Not Otherwise Classified |
| IARC | International Agency for Research on Cancer | PPE | Personal Protective Equipment |
| LC50 | Median Lethal Concentration | ppm | parts per million |
| LD50 | Median Lethal Dose | RCRA | Resource Conservation and Recovery Act |
| LD_{Lo} | Lowest Dose to have killed animals or humans | RTECS | Registry of Toxic Effects of Chemical Substances |
| LEL | Lower Explosive Limit | SARA | Superfund Amendment and Reauthorization Act |
| µg/m³ | microgram per cubic meter of air | SCBA | Self-contained Breathing Apparatus |
| mg/m³ | milligram per cubic meter of air | STEL | Short-term Exposure Limit |
| mppcf | million particles per cubic foot | TLV | Threshold Limit Value |
| SDS | Safety Data Sheet | TWA | Time-weighted Average |
| MSHA | Mine Safety and Health Administration | UEL | Upper Explosive Limit |
| NFPA | National Fire Protection Association | | |

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