



ArcelorMittal

Material Safety Data Sheet

Section 1 - Chemical Product and Company Identification

Product/Chemical Name: Blast Furnace Iron

MSDS ID Number: AM USA - 013

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

CAS Number: Mixture

Manufacturer: ArcelorMittal USA LLC
1 South Dearborn Street
Chicago, IL 60603-9888

General Information: 1-219-787-4901 or email at: msdssupport@arcelormittal.com

Original Issue Date: 12/06/2002

CHEMTREC (Day or Night): 1-800-424-9300

Revised: 01/01/2013

Emergency Contact: 1-760-476-3962, 3E Company Code: 333211

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/m ³ - Iron oxide fume	5.0 mg/m ³ - Iron oxide dust and fume
Carbon	7440-44-0	4 – 5.5	15 mg/m ³ (as total dust, PNOR ³) 5.0 mg/m ³ (as respirable fraction ⁶ , PNOR)	10 mg/m ³ (as inhalable fraction ⁴ , PNOS) ⁵ 3.0 mg/m ³ (as respirable fraction, PNOS)
Manganese	7439-96-5	0.2 – 1.0	“C” 5.0 mg/m ³ (as fume & Mn compounds)	0.2 mg/m ³
Phosphorus	7723-14-0	0.04 – 0.2	0.1 mg/m ³	0.1 mg/m ³
Silicon	7440-21-3	0.1 – 4.0	15 mg/m ³ (as total dust) 5.0 mg/m ³ (as respirable fraction)	10 mg/m ³
Sulfur	7704-34-9	0.02 – 0.3	15 mg/m ³ (as total dust, PNOR) 5.0 mg/m ³ (as respirable fraction, PNOR)	10 mg/m ³ (as inhalable fraction, PNOS) 3.0 mg/m ³ (as 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.
 - Percentages are expressed as typical ranges or maximum concentrations of trace elements for the purpose of communicating the potential hazards of the finished product. Consult product specifications for specific composition information.
- OSHA (Occupational Health and Safety Administration) 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 STEL (Short Term Exposure Limit) is defined as a 15-minute exposure, which should not be exceeded at any time during a workday.
 - TLV (Threshold Limit Values) established by ACGIH (the American Conference of Governmental Industrial Hygienists) are 8-hour TWA concentrations unless otherwise noted.
 - PNOR (Particulates Not Otherwise Regulated) - All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the PNOR limit which is the same as the inert or nuisance dust limit of 15 mg/m³ for total dust and 5.0 mg/m³ for the respirable fraction.
 - 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 2009 TLVs® and BEIs® (Biological Exposure Indices) Appendix D, paragraph A.
 - PNOS (Particulates Not Otherwise Specified) - Particulates identified under the PNOS heading are “nuisance dusts” containing no asbestos and <1% crystalline silica. A TWA-TLV of 10 mg/m³ for inhalable particulate and 3.0 mg/m³ for respirable particulate has been recommended.
 - 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 2009 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 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. After excessive exposures, onset of symptoms present after a few hours 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 (The International Agency for Research on Cancer).
- **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) of pneumoconiotic agents may act synergistically with inhalation of oxides, fumes or dusts of this product to cause toxic effects.

Carcinogenicity: IARC, NTP (The National Toxicology Program), 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 obtain medical advice.

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 to prevent contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: No Information found (NIF).

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 (National Institute for Occupational Safety and Health)-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 >1537.8°C, (>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: Not Applicable

Density: 7.85

Specific Gravity (H₂O = 1, at 4 °C): 7.0

pH: Not Applicable

Water Solubility: Insoluble

Other Solubilities: Not Applicable

Boiling Point: 2760°C, (5000 °F)

Viscosity: Not Applicable

Refractive Index: Not Applicable

Surface Tension: Not Applicable

% Volatile: Not Applicable

Evaporation Rate: Not Applicable

Freezing/Melting Point: Not Applicable

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

Toxicity Data: * No Information Found (NIF) 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.

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

Acute Oral Effects: No Information Found (NIF).

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

Chronic Effects: Refer to Section 3

Carcinogenicity: NIF

Mutagenicity: NIF

Teratogenicity: NIF

* 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 information found 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 Information Found (NIF).

Environmental Degradation: NIF

Soil Absorption/Mobility: No information found 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: No Information Found (NIF).

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: Cast Iron

Shipping Symbols: "HOT"

Hazard Class: Not Applicable

ID No.: Not Applicable

Packing Group: Not Applicable

Label: Not Applicable

Special Provisions (172.102): Not Applicable

Packaging Authorizations

a) **Exceptions:** Not Applicable

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 an ArcelorMittal USA LLC 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-2, Z-3): The product is not listed; however, individual components of the product are listed (Refer to Section 2).

EPA Regulations:

RCRA: The product and components are not regulated under this act.

CERCLA Hazardous Substance (40 CFR 302.4): The product 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: The product and components are not regulated under section 307, Priority Pollutants. However, Phosphorus is a Section 311 Hazardous Chemical.

Safe Drinking Water Act: The product and components are not regulated under this act.

State Regulations: The product 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: Does not Contain elements known to the State of California to cause cancer or reproductive toxicity.

Other Regulations: The product may not be listed in any state regulations. However, individual components of the product may be listed in various state regulations.

WHMIS (Canadian): D2B Product Classification

Section 16 – Other Information

Prepared By: ArcelorMittal USA LLC

Hazard Rating Systems:

NFPA Code: 0-0-0

HMIS Code: 0-0-0

PPE: See Section 8

ABBREVIATIONS/ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists
BEIs	Biological Exposure Indices
CAS	Chemical Abstracts Service
CERCLA	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/m ³	microgram per cubic meter of air
mg/m ³	milligram per cubic meter of air
mppcf	million particles per cubic foot
MSDS	Material 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

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LABEL

Blast Furnace Iron

GENERAL HAZARD STATEMENT: 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 promptly. If appropriate, respiratory protection and other personal protective equipment should be used.

CAUTION

IRON IN THE MOLTEN STATE PRESENTS AN INHALATION AND CONTACT HAZARD

CONTACT WITH MOLTEN METAL WILL CAUSE SEVERE BURNS AND BLINDNESS

Consult MSDS for more information

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. Wear appropriate personal protective equipment.

FIRST AID:

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, obtain medical advice.

For additional information refer to appropriate Material Safety Data Sheet available at:

<http://arcelormittal-environment.com/Default.aspx?tabid=103>

Product Name: Blast Furnace Iron

ArcelorMittal USA LLC

1 South Dearborn Street Chicago, IL 60603-9888

General Information:

**msdssupport@arcelormittal.com or
1-219-787-4901**

Original Issue Date: 01/01/2011

Revised: 01/01/2013

MANUFACTURER'S MATERIAL SAFETY DATA SHEET

SECTION I – PRODUCT AND COMPANY IDENTIFICATION

Product Identification

Product Name: Hot Briquetted Iron (HBI)
Trade Name: Hot Briquetted Iron (HBI)
Chemical Name: Iron
Product Use: Iron and Steel Production

**Description as per IMO IMSBC
Code Appendix 1:**

Proper Shipping Name: Direct Reduced Iron (A), Briquettes, hot-molded
IMO Class: Material Hazardous only in Bulk (MHB)
Group: B

US Coast Guard Special Permits: Issued to each shipper pursuant to 46 CFR 148.01-9 of the U.S. Coast Guard (USCG) Carriage of Solid Hazardous Materials in Bulk Regulations.

Date of MSDS: April 2008

Company Identification

Manufacturer's Name:
Address:

Phone Numbers:
Fax Numbers:
Emergency Numbers:

SECTION II – Composition/Information on Ingredients

CHEMICAL DATA: (percentages by weight)

Total Iron (TFe):	90 -94 %
Metallic Iron (MFe):	83 - 88 % Minimum
Carbon (C):	0.8-2.0 %
Sulfur (S) as sulphide:	0.003 – 0.03 %
Phosphorus (P) as P ₂ O ₅ :	0.02 – 0.13 % Maximum
Gangue:	1.95 – 5.10 % Maximum

INGREDIENTS

Ingredient	National Institute of Standards and Technology Chemical Abstract System (CAS) Number	Concentration
HBI (Iron Furnace)	65996-67-0	
IRON	7439-89-6	81-88%
IRON (II) OXIDE	1345-25-1	4-8%
IRON (III) OXIDE	1309-37-1	2-8%
METAL OXIDE	Not Available	<4%
CARBON	7440-44-0	0.4-2.0%

SECTION III – Hazards Identification Including Emergency Overviews

HAZARD INFORMATION

Class	Not Classified as Dangerous. Material Hazardous only in Bulk (MHB) as per IMO IMSBC Code.
Ingredients	No known hazardous ingredients
Poisons Schedule	Not scheduled

HEALTH EFFECTS

Acute Ingestion	If swallowed, dust or small pieces may cause gastrointestinal disturbances. An overdose of iron may cause irritation to the mouth, esophagus and stomach. Symptoms may include nausea, vomiting, abdominal pain, bloody diarrhea and shock.
Excessive Eye contact	Dust and small pieces may cause mechanical irritation, redness and pain in contact with the eyes, which can result in redness and lacrimation. May cause conjunctivitis.

Acute Skin Contact	Dust and small pieces may cause mechanical irritation in contact with the skin, which can result in slight redness.
Excessive Inhalation	Inhalation of dust may cause irritation to the respiratory tracks. Symptoms may include coughing, sneezing, soreness of the throat and breathing difficulties.
Chronic	Repeated or prolonged exposure to this material may result in skin irritation in individuals with sensitive skin. Chronic exposure to iron dust has been associated with benign pneumoconiosis, not affecting lung function. Persons with impaired respiratory functions may be more susceptible to the effects of the substance.
Decomposition	May produce toxic iron fumes when heated to decomposition (1,535 °C)

SECTION IV – First Aid Measures

FIRST AID

If Swallowed Inhalation	Induce vomiting immediately. Seek medical attention. Remove person to fresh air. Get medical attention in case of breathing difficulty.
Eyes	If contact with eye(s) occurs, wash with copious amounts of water for approximately 15 minutes holding eyelid(s) open. If irritation develops and persists seek medical attention.
Skin	Wash gently and thoroughly with water and soap. Ensure contaminated clothing is washed before re-use or discard. If irritation develops and persists seek medical attention.
First Aid Facilities	Eye wash fountains and normal wash room facilities

ADVICE TO DOCTOR

Advice to Doctor	Treat symptomatically or consult a Poison Information Center
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SECTION V – Fire Fighting Measures

FIRE AND EXPLOSION HAZARD DATA

- Material may slowly evolve hydrogen after contact with water and reacts more rapidly with salt water. Proper surface ventilation shall be provided for material in enclosed spaces. Temporary small increase in temperature may be expected after material handling in bulk. Maximum allowed shiploading temperature 65°C. If temperature exceeds 65°, provide adequate surface ventilation to remove any hydrogen gas generation. Do not allow any hot work/spark

generation on deck or surroundings.

- Non-flammable when correctly piled. May self-heat if piled incorrectly. In fire situation, evacuate area and contact emergency services. Remain upwind and notify those downwind of hazard.

FIRE FIGHTING PROCEDURES

- Wear fire protective clothing
- Wear self-contained breathing apparatus when entering enclosed spaces with HBI.
- Wear non-sparking footwear.
- Avoid all sources of ignition.
- Remove the hot material from the stack. On a ship, a clamshell bucket may be used.
- Divide hot material into small piles and spread it out to less than 0.5 m deep. The material will quickly cool below the ignition point.
- In case it is not practical to spread the material over a wide area such as in a hold of a ship, coverage using a non-oxidant material (e.g. sand, and finely crushed slag) could be used, for smothering the fire and hindering the air supply. This technique would need to be decided depending on the emergency because it would contaminate the material.
- Do not use CO₂ as CO may be formed. Do not use dry chemical.
- **DO NOT USE EITHER FRESH WATER OR SEAWATER TO COOL DOWN HOT MATERIAL** in enclosed spaces such a cargo hold on a ship, unless strictly necessary to keep integrity of vessel and under Master's expertise. If water is used: i) use large amount of water to flood the material and ii) provide adequate ventilation to let hydrogen gas generated escape to atmosphere.
- In fire situation, evacuate area and contact emergency services
- Emergency Schedule to follow for packaged material: **GOLF**, as per IMDG Code

SECTION VI – Accidental Release Measures

Material in bulk:	Broken pieces and dust generated during loading and unloading should be collected and dispose adequately.
Material in packaged form: e.g. samples	Ventilate area if spilled into enclosed space. Use protective equipment specified in Section 8. Pick-up and place in a suitable container for reclamation or disposal. Avoid contact with strong oxidizers.
Emergency Schedule to follow for Spillage for packaged material:	November / Oscar / Papa, as per IMDG Code

SECTION VII – Handling and Storage

Storage Precautions	Store in cool, dry, well ventilated area removed from oxidizing agents, flammable materials (e.g. coke, wood), sources of heat (e.g. steam lines) and foodstuffs. The HBI can be stored in open yards uncovered.
Handling	The HBI can be handled substantially the same as scrap. It can be moved from one side to another, stored and transported safely in all types of weather due to its density and good physical and chemical stability.

SECTION VIII – Exposure Controls, Personal Protection

Respirator Type (NIOSH N95)	During handling dust is generated; and if ventilation is inadequate, the use of an N95-type respirator is advisable.
Eye Protection	During handling dust is generated, e.g. loading, unloading, cutting or sanding; the use of safety goggles is advisable.
Hand Protection	Use of canvass gloves is advisable.
Head Protection	During handling, material can spill and use of helmet is advisable.

SECTION XIX – Physical and Chemical Properties

Physical State	Solid
Appearance	From Light Gray to Gray Black
Odor	Odorless
Apparent Density (gm/cm ³)	5.0 Minimum
Bulk Density (MT/m ³)	Range 2.5 – 2.8
Stowage factor (m ³ /MT)	0.35 – 0.40
Angle of Repose	38°
Fines under 6.35 mm	5% max.
Porosity	15 % Maximum
Water Pick-up	3.0 % Maximum
Dimensions (mm)	110 x 50 x 30
Solubility in water	Insoluble
Melting Point	APPROX. 1500 DEGREES CENTIGRADE
Boiling Point	APPROX. 3000 DEGREES CENTIGRADE
Vapour Pressure	NOT AVAILABLE
Specific Gravity	APPROX. 5 (WATER = 1)
Flash Point	NOT APPLICABLE
Flammable Limit LEL	NOT APPLICABLE
Flammable Limit UEL	NOT APPLICABLE
Solubility in Water	INSOLUBLE

OTHER PROPERTIES

Corrosiveness	NOT CORROSIVE TO ALUMINIUM
Stability	STABLE UNDER NORMAL CONDITIONS OF USE
Hazardous Polymerization	WILL NOT OCCUR
Materials to Avoid	STRONG ACIDS AND OXIDIZING AGENTS

SECTION X – Stability and Reactivity Data

STABILITY AND REACTIVITY DATA

Exposure Limits	No exposure standards have been established for this material.
Reactivity	Stable in dry air and under normal conditions but oxidizes in fresh water and more readily in seawater forming rust and generation of hydrogen gas. Incompatible with oxidizing agents, e.g., acids, hydrogen peroxide and nitrogen dioxide.

SECTION XI – Toxicological Information

Toxicology	No toxicity data is available for this material
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SECTION XII – Ecological Information

This material is not considered a contaminant to the environment.
It can be recycled.
HBI or any dust generated during handling if left in the atmosphere will oxidize and eventually return to its natural state: Iron oxide.
Avoid spillage in land or water.
Local environmental regulations should be followed.

SECTION XIII – Disposal Consideration

Waste Disposal	Recycle where possible. Alternatively, it can be traded as a raw material for iron or steel production.
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SECTION XIV – Transport Information

Truck and Rail Road Transportation It should be transported in the same way as with other bulk materials. Local transportation regulations should also be followed.

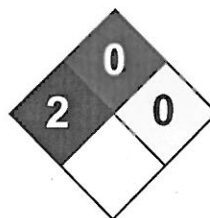
Maritime Transport Classified as MHB, Briquettes Hot Molded under the regulations for ocean transport contained in the International Maritime Organization publication "International Maritime Solid Bulk Cargoes Code (IMSBC Code)"
US Coast Guard Special Permits pursuant to 46 CFR 148.01-9 of the U.S. Coast Guard (USCG) Carriage of Solid Hazardous Materials in Bulk Regulations.

SECTION XV – Regulatory Information

OSHA / EPA Not provided

SECTION XVI – Other Information

Others Not provided



Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet Alumina MSDS

Section 1: Chemical Product and Company Identification

<p>Product Name: Alumina</p> <p>Catalog Codes: SLA1906</p> <p>CAS#: 1344-28-1</p> <p>RTECS: BD1200000</p> <p>TSCA: TSCA 8(b) inventory: Aluminum oxide</p> <p>CI#: Not applicable.</p> <p>Synonym: Alumina, Activated, 80-200 Mesh</p> <p>Chemical Name: Aluminium Oxide</p> <p>Chemical Formula: Al₂O₃</p>	<p>Contact Information:</p> <p>Sciencelab.com, Inc. 14025 Smith Rd. Houston, Texas 77396</p> <p>US Sales: 1-800-901-7247 International Sales: 1-281-441-4400</p> <p>Order Online: ScienceLab.com</p> <p>CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300</p> <p>International CHEMTREC, call: 1-703-527-3887</p> <p>For non-emergency assistance, call: 1-281-441-4400</p>
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Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Aluminum oxide	1344-28-1	100

Toxicological Data on Ingredients: Aluminum oxide LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Classified None. for human. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Chlorine Trifluoride reacts violently with Aluminum Oxide producing a flame.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 24°C (75.2°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 10 (mg/m³) from ACGIH (TLV) [United States] Inhalation Total. TWA: 10 (mg/m³) [Canada] Inhalation Total. TWA: 5 (mg/m³) from OSHA (PEL) [United States] Inhalation Respirable. TWA: 15 from OSHA (PEL) [United States] Inhalation Total. TWA: 10 [United Kingdom (UK)] Inhalation Total. TWA: 4 [United Kingdom (UK)] Inhalation Respirable. Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Solid crystalline powder.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 101.96 g/mole

Color: White.

pH (1% soln/water): Not applicable.

Boiling Point: 2980°C (5396°F)

Melting Point: 2072°C (3761.6°F)

Critical Temperature: Not available.

Specific Gravity: 4 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:

Very slightly soluble in cold water. Insoluble in hot water. Practically insoluble in non-polar organic solvents. Slowly soluble in aqueous alkalie solution-forming hydroxides. Very slightly soluble in acid, alkali.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Chlorine Trifluoride reacts violently with Aluminum Oxide producing a flame. Ethylene oxide may polymerize violently when in contact with highly catalytic surfaces such as pure Aluminum Oxide. Reacts with hot chlorinated rubber.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. TERATOGENIC EFFECTS: Classified None. for human.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May cause cancer (tumorigenic) according to animal data. No human data found.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: May cause skin irritation. Eyes: Nuisance Dust. Dust may cause mechanical eye irritation. Inhalation: Nuisance Dust. Material is irritating to mucous membranes and upper respiratory tract. May cause lung injury. Ingestion: May be harmful if swallowed. Ingestion of large amounts may cause gastrointestinal tract irritation. It is expected to be a low hazard for normal industrial handling.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:

Illinois toxic substances disclosure to employee act: Aluminum oxide Rhode Island RTK hazardous substances: Aluminum oxide Minnesota: Aluminum oxide Massachusetts RTK: Aluminum oxide New Jersey: Aluminum oxide New Jersey spill list: Aluminum oxide California Director's list of Hazardous Substances: Aluminum oxide TSCA 8(b) inventory: Aluminum oxide SARA 313 toxic chemical notification and release reporting: Aluminum oxide

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):

R36/38- Irritating to eyes and skin. S2- Keep out of the reach of children. S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References:

-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.

Other Special Considerations: Not available.

Created: 10/10/2005 12:47 AM

Last Updated: 05/21/2013 12:00 PM

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Material Safety Data Sheet
For
Ground Granulated Blast Furnace Slag
DURA SLAG™

Section I – Identity

Material Name: Ground Granulated Blast Furnace Slag (GGBS/GGBFS, or Slag Powder)
Trade Name: DURA SLAG™
Description: A ground powder made with an appropriate mill from a glassy granular material formed when molten iron blast furnace slag is rapidly chilled as by immersion in water.
CAS Reg. No.: N/A (Mixture)
Revision Date: November 2011
Contact Phone No.: (913) 451-8900
Manufacturer: Ash Grove Cement Company
11011 Cody
Overland Park, KS 66210

Section II – Ingredients Identity

Ingredient:	Iron Blast-Furnace Slag	
Components	CAS Number	Percentage (Approx.)
Calcium oxide (CaO)	1305-78-8	30-50
Silicon dioxide (amorphous) (SiO ₂)	7631-86-9	30-40
Magnesium oxide (MgO)	1309-48-4	2-14
Alumina (Al ₂ O ₃)	1344-28-1	7-18
Iron oxide (Fe ₂ O ₃)	1309-37-1	0.1-1.8
Manganese oxide (MnO)	7439-96-5	0-1.0
Sulfur (S)	7704-34-9	0-2.0
Gypsum	13397-24-5	0-5

Slag is a nonmetallic byproduct of the production from the production of iron. Trace amounts of chemicals may be detected during chemical analysis. For example, slag may contain trace amounts of titanium oxide, chromium compounds, sulfur compounds, and other trace compounds.

Section III – Physical Data of Material

Boiling Point: N/A
Specific Gravity (H₂O=1): 2.80-2.95
Vapor Pressure (mm Hg): N/A
Melting Point: N/A
Vapor Density (AIR=1): N/A

NRDC - SETE ATTACHMENT FOUR



Evaporation Rate:	N/A
Solubility in Water:	0.1-0.5%
Appearance & Odor:	Beige to white powder with traces of sulfur odor

Section IV – Fire and Explosion Hazard of Material

Flash Point:	N/A.
Extinguishing Media:	Use media suitable for surrounding fire.
Special Fire Fighting Procedures:	None.
Unusual Fire & Explosion Hazards:	None Reported.
Flammable Limits:	N/A.
Lower Explosive Limit:	N/A.
Upper Explosive Limits:	N/A.

Section V – Reactivity Data

Stability:	Stable. Keep dry until use. Slag may react with water resulting in slight release of heat, depending on the amount of calcium oxide present. Avoid contact with incompatible materials.
Conditions to Avoid (Stability):	Avoid moisture. Keep dry until used.
Incompatibility:	Slag is incompatible with acids, ammonium salts, and aluminum metal. Slag dissolves in hydrofluoric acid, producing corrosive silicon tetrafluoride gas. Slag reacts with water to form silicates and calcium hydroxide. Silicates react with powerful oxidizers such as fluorine, boron trifluoride, chlorine trifluoride, manganese trifluoride, and oxygen difluoride.
Hazardous Decomposition/Byproducts:	Hydrogen sulfide may be released from moist or wet slag when heated. Respirable dust particles may be generated when the product is handled.
Hazardous Polymerization:	Will not occur. No conditions to avoid.

Section VI - Health Hazard Data

SECTION VI: HEALTH HAZARD DATA AND FIRST AID

EXPOSURE LIMITS:

Unless specified otherwise, limits are expressed as a time-weighted average (TWA) concentration for an 8-hour work shift of a 40-hour workweek.

Abbreviations:

ACGIH TLV: Threshold limit value of the American Conference of Governmental Industrial Hygienists (ACGIH). The Federal Mine Safety and Health Administration (MSHA) has adopted the TLVs established by ACGIH, as set forth in the 1973 edition of "TLVs Threshold Limit Values for Chemical Substances in Workroom Air Adopted by ACGIH for 1973".



IARC: International Agency for Research on Cancer

m.p.p.c.f.: Millions of particles per cubic foot of air, based on impinger samples counted by lightfield techniques; this is an antiquated form of measurement and is seldom used.

mg/m³: Milligrams of substance per cubic meter of air.

NIOSH REL: Recommended exposure limit of the National Institute for Occupational Safety and Health (NIOSH), expressed as a TWA concentration for up to a 10-hour workday during a 40- hour workweek.

NIOSH STEL: NIOSH Short Term Exposure Limit. This is a 15-minute TWA exposure that should not be exceeded at any time during a workday.

NTP: National Toxicology Program

OSHA ACC: Acceptable Ceiling Concentration set by the federal Occupational Safety and Health Administration (OSHA). Under OSHA regulations, an employee's exposure to an acceptable ceiling concentration shall not exceed at any time during an 8-hour shift the acceptable ceiling concentration limit given for the substance, except for a time period, and up to a concentration not exceeding the maximum duration and concentration allowed as specified under the subheading "acceptable maximum peak above ACC for an 8-hour shift". If no such subheading appears, then employee exposure shall never exceed the acceptable ceiling concentration limit.

OSHA PEL: Permissible exposure limit of OSHA.

Calcium Oxide (CaO)	OSHA PEL: 5 mg/m ³	ACGIH TLV: 5 mg/m ³	NIOSH REL: 2 mg/m ³
Amorphous Silicon Dioxide (SiO₂)	OSHA PEL: 80 mg/m ³ ÷ % SiO ₂	ACGIH 1973 TLV: 20 m.p.p.c.f.; 2005 ACGIH TLV: withdrawn due to insufficient data	NIOSH REL: 6 mg/m ³
Magnesium Oxide (MgO)	OSHA PEL: (total particulate) 15 mg/m ³	ACGIH TLV: 10 mg/m ³	NIOSH REL: Not listed
Alumina (Al₂O₃)	OSHA PEL: (respirable) 5 mg/m ³ , (total dust) 15 mg/m ³	ACGIH TLV: 10 mg/m ³	NIOSH REL: Not listed
Iron Oxide (Fe₂O₃)	OSHA PEL: 10 mg/m ³	ACGIH TLV: 10 mg/m ³	NIOSH REL: 5 mg/m ³
Manganese Oxide (MnO)	OSHA ACC: 5 mg/m ³	ACGIH TLV: 5 mg/m ³	NIOSH STEL: 3 mg/m ³ ; NIOSH REL: 1 mg/m ³
Sulfur (S)	OSHA PEL: Not listed	ACGIH TLV: Not listed	NIOSH STEL: Not listed
Other Particulates	OSHA PEL: total particulate, not otherwise regulated) 15 mg/m ³ ; (respirable particulate, not otherwise regulated) 5 mg/m ³	ACGIH TLV (nuisance particulates) 10 mg/m ³ .	



HEALTH HAZARDS:

Primary Route(s) of Entry:

Inhalation: Yes **Skin:** Yes **Ingestion:** No or unlikely.

Acute:

Eye Contact: May cause immediate or delayed irritation to the eyes. Direct contact by larger amounts of material or splashes of wet material may cause effects ranging from moderate eye irritation to chemical burns and blindness. Eye exposures require immediate first aid to prevent significant damage to the eye.

Inhalation: Dusts may irritate the nose, throat, and respiratory tract. Coughing, sneezing, and shortness of breath may occur following exposures in excess of appropriate exposure limits.

Skin Contact: Exposure to dry material may cause drying of the skin with consequent mild irritation. Dry material contacting wet skin or exposure to moist or wet material may cause more severe skin effects including thickening, cracking or fissuring of the skin. Prolonged exposure can cause severe skin damage in the form of (caustic) chemical burns.

Ingestion: Ingestion of large amounts may cause gastrointestinal irritation and blockage.

Chronic:

Inhalation: Inhalation of slag dust can cause inflammation of the lining of the nose.

Carcinogenicity: Slag is not listed as a carcinogen by IARC or NTP. However, slag may contain trace amounts of substances (such as hexavalent chromium) that are classified by IARC and NTP as carcinogens.

Eye Contact: Exposure to slag dust may cause inflammation of the cornea.

Skin Contact: Hypersensitive individuals may develop allergic dermatitis due to the potential presence of trace amounts of hexavalent chromium.

Signs & Symptoms of Exposure: Irritation of eyes, skin and/or respiratory system.

Medical Conditions Generally Aggravated by Exposure: Inhaling respirable dust may aggravate existing respiratory system disease(s) and/or dysfunctions such as emphysema or asthma. Exposure may aggravate existing skin and/or eye conditions.

EMERGENCY & FIRST AID PROCEDURES:

Eyes: Immediately flush eye(s) with plenty of clean water for at least 15 minutes, while holding the eyelid(s) open. Beyond flushing, do not attempt to remove material from the eye(s). Contact a physician if irritation persists or later develops.

Inhalation: Remove to fresh air. Dust in throat and nasal passages should clear spontaneously. Contact a physician if irritation persists or later develops.

Skin: Wash with cool water and a pH-neutral soap or mild detergent intended for use on skin. Seek medical treatment in all cases of prolonged direct exposure to wet product or prolonged wet skin exposure to dry product.

Ingestion: Do not induce vomiting. If person is conscious, give large quantity of water. Get immediate medical attention.



Section VII - Preventive Measures

Ventilation: Local exhaust or general ventilation adequate to maintain exposures below appropriate exposure limits.

Other: Exposure levels should be monitored regularly. Exposure levels in excess of appropriate exposure limits should be reduced by all feasible engineering controls, including (but not limited to) ventilation, process enclosure, and enclosed employee workstations.

Respiratory Protection: When exposure levels exceed or are likely to exceed appropriate exposure limits, follow MSHA or OSHA regulations, as appropriate, for use of NIOSH-approved respiratory protection equipment.

Skin Protection: Protective gloves, shoes and protective clothing that are impervious to water should be worn to avoid contact with skin.

Eye Protection: Safety glasses with side shields should be worn as minimum protection. Dust goggles should be worn when excessive (visible) dust conditions are present or anticipated. Contact lenses should not be worn when working with this product.

Hygiene: Periodically wash exposed skin with a pH-neutral soap. Wash again before eating, drinking, smoking, and using toilet facilities. Wash work clothes after each use. If clothing becomes saturated with wet material, it should be removed and replaced with clean, dry clothing.

Respirable dust may be generated during processing, handling, and storage. The personal protection and controls identified in Section VII of the MSDS should be applied as appropriate.

Keep product dry until used.

Do not store or handle near food and beverages or smoking materials.

The personal protection and controls identified in Section VII of the MSDS should be applied as appropriate.

Steps to be taken if material is released or spilled: Use dry clean-up methods that do not disperse dust into the air. Avoid actions that cause dust to become airborne. Avoid inhalation of dust and contact with skin. Wear appropriate personal protective equipment. Scrape up wet material and place in an appropriate container. Allow the material to "dry" before disposal.

Waste Disposal Method: Do not attempt to wash material down drains. Dispose of waste materials only in accordance with applicable federal, state, and local laws and regulations.

Section VIII – Toxicological and Ecological Information

For questions regarding toxicological or ecological information, see the contact information in Section I.



Section IX – Disposal Considerations

Dispose of waste and containers in compliance with applicable federal, state, and local regulations

Section X – Transport Information

This material is not classified as a Hazardous Material under U.S. DOT or Canadian TDG regulations.

Section XI – Regulatory Information

**OSHA/MSHA Hazard
Communication**

This material is considered to be a hazardous chemical by OSHA and MSHA and should be included in the employer's hazard communication program.

**CERCLA/Superfund
EPCRA SARA Title III**

This product is not listed as a CERCLA hazardous substance. This product has been reviewed according to the EPA hazard categories promulgated under sections 311 and 312 under the Superfund Amendment and Reauthorization Act of 1986 and is considered a hazardous chemical and delayed health hazard.

EPCRA SARA Section 313

This product may contain substances subject to the reporting requirements of Section 313 of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR Part 372.

RCRA

If discarded in its purchased form this product would not be a hazardous waste either by listing or characteristic. However, under RCRA, it is the responsibility of the user to determine at the time of disposal whether a material containing the product or derived from the product should be listed as a hazardous waste. Slag is exempt from reporting under the inventory update rule. Hexavalent chromium is known by the State of California to cause cancer.

**TSCA
California Proposition 65**

WHMIS/DSL

Products containing calcium oxide are classified as D2A, E and are subject to WHMIS requirements.

Ash Grove Cement understands the information contained herein is accurate as of the date shown thereon. Like any printed material, it may become out of date over time and thus, a printed copy should be considered current only as of the date of print. Material Safety Data Sheets (MSDSs) are intended for use in the workplace to meet right-to-know requirements, for employees to safely handle materials in their workplaces, and to dispose of them properly. Ash Grove Cement assumes no liability in connection with the use of the information herein which is not intended, and this MSDS should not be construed as legal advice or as insuring compliance with any other federal, state, or local laws or regulations. Any party using this product should review all such laws, rules, or regulations prior to use, including but not limited to US and Canada Federal, Provincial and State regulations.

NO WARRANTY IS MADE, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE.

This product neither contains nor is directly manufactured with any controlled ozone depleting substances, Class I and II.

FLY ASH

Material Safety Data Sheet

Hazardous Nature: This product is potentially classified as hazardous depending on jurisdiction and use.

Product Identification: Pozzolan, Fly Ash, Class F Fly Ash, Class C Fly Ash

Use: Supplementary cementitious material for concrete and concrete products. Also used in soil stabilization and as a fine filler in asphalt and other products.

Hazardous Chem Code: Not Applicable

Poisons Schedule: Not Scheduled

Dangerous Goods Class: Not Applicable

Physical Description/Properties:

- Appearance: Fine powder - light to dark grey or shades of brown or buff in color.
- Boiling/Melting Point: Melting point > 1400 o C
- Vapour Pressure: Not Applicable
- Percent Volatiles: Not Applicable
- Specific Gravity: 2.05 to 2.8
- Flash Point: Not Applicable
- Flammability Limits: Not Applicable
- Auto Ignition Temp: Not Applicable
- Solubility In Water: Essentially insoluble. Some Class C fly ashes may have soluble sodium sulfate (1-8%).
- Respirable Fraction: Approximately 20% - 40% of particles are below 7 micron in diameter (i.e. in the respirable range).
- Other Properties: Not Applicable

Ingredients: Chemical Entity Proportions

- Silica-Crystalline, as Quartz 1-5%
- Mullite 1 - 5%

Note: Fly ash is a byproduct of coal combustion. The material is composed primarily of complex aluminosilicate glass, mullite, hematite, magnetite spinel and quartz. The proportion of quartz (crystalline silica) in the fly ash varies depending on the quartz content of the coal. Class C fly ash may have 1-7% free CaO and calcium sulfate as well as calcium aluminosilicate glass.

Health Hazard Information: Short Term Exposure

- Swallowed: Unlikely under normal conditions of use. Swallowing fly ash may cause abdominal discomfort.
- Eyes: Irritating to eyes causing watering and redness.
- Skin: Irritating to skin - can cause irritant/contact dermatitis from mechanical abrasion or alkaline composition(Class C fly ash).
- Inhaled: Irritating to the nose, throat and respiratory tract causing coughing and sneezing.
- Long Term Exposure
- Swallowed: Not Applicable
- Eyes: Not Applicable
- Skin: Not Applicable
- Inhaled: Repeated inhalation of dust containing crystalline silica can cause bronchitis, silicosis (scarring of the lung) and lung cancer. It may also increase the risk of scleroderma (a disease affecting the connective tissue of the skin, joints, blood vessels and internal organs). Studies have shown that smoking increases the risk of bronchitis, silicosis and lung cancer in persons exposed to crystalline silica. It is recommended that all storage and work areas should be smoke free zones. Inhalation of high levels of fly ash dust may result in severe inflammation of the small airways of the lung and asthma-like symptoms.

First Aid:

- Swallowed: Give plenty of water to drink. If any acute gastrointestinal distress, seek medical attention.
- Eyes: Flush thoroughly with flowing water for 15 minutes. If symptoms or irritation persist, seek medical attention.
- Skin: Wash thoroughly with mild soap and water. Some Class C fly ashes are quite hydraulic and alkaline; contact with wet skin may result in burns.
- Inhaled: Remove to fresh air, away from dusty area. If symptoms persist, seek medical attention.

Exposure Limits

- Crystalline Silica (Quartz): 0.2 mg/m³ TWA (time-weighted average) as respirable dust.
- Dust (NOS - not otherwise specified): 10 mg/m³ TWA as inspirable dust. However, where a state, territory or local authority prescribes a lower exposure standard, the lower standard applies.
- Recommendations: Keep exposure to dust as low as practicable. Respirable crystalline silica levels should be kept below 0.1 mg/m³ TWA, and respirable dust below 5 mg/m³ TWA.

Engineering Controls: Avoid generating dust. When handling fly ash, use local mechanical ventilation or extraction in areas where dust could escape into the work environment. For bulk deliveries, closed pumping systems are recommended. For handling of individual bags, follow instructions below if no local exhaust ventilation is available. Work areas should be cleaned regularly by wet sweeping or vacuuming. If generating dust cannot be avoided, follow personal protection recommendations below.

Personal Protection:

- Skin: Wear loose comfortable clothing. Wash work clothes regularly. Apply barrier cream to hands or wear cotton or light duty leather gloves or equivalent.
- Eyes: Safety spectacles with side shields or safety goggles should be worn if dust likely to be generated.
- Respiratory: None required if engineering and handling controls are adequate. If dust is generated wear a suitable particulate respirator. Use only respirators which bear the standards mark and are fitted correctly. Note that persons with facial hair will have difficulty in obtaining a satisfactory face seal.

Ventilation: Refer to Engineering Controls

Flammability: Non-flammable

Storage and Transport: Keep in a dry place. When handled pneumatically use standard dust filters on vehicles and silos.

Spills and Disposal: Follow above safety requirements under "Precautions for Use" and wet sweep or vacuum dust with industrial vacuum cleaner. A fine water spray should be used to suppress dust when sweeping. Collect in containers and dispose of as trade waste in accordance with local authority guidelines. Keep out of stormwater and sewer drains.

Fire/Explosion Hazard: Not flammable. Does not decompose on heating.

Note: The provision of this information should not be construed as a recommendation to use this product in violation of any patent rights or in breach of any statute or regulation. Users are advised to make their own determination as to the suitability of this information in relation to their particular purposes and specific circumstances. Each user should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace and in conjunction with other substances or products. Individual responsibility must be taken as to proper use and handling of product.



United States Steel Corporation

Iron Desulfurization Slag Fines Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS)

USS IHS Number: 75372
(Replaces USS Code Number: N/A)

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

Original Issue: 5/10/2011

Revised: 03/31/2014

Expiration: 03/31/2017

Section 1 – Chemical Product and Company Identification

GHS Product Identifier: Iron Desulfurization Slag Fines
Other means of identification: Desulfurization Slag Fines, Desulf Fines, C-Kish, Kish C-Waste
CAS Number: 65996-71-6
Supplier Details: United States Steel Corporation, 600 Grant Street, Room 1662, Pittsburgh, PA 15219-2800
Phone Number (s): (412) 433-6840 (8:00 am to 5:00 pm); FAX: (412) 433-5019
Off-Hour Emergency Phone Number: 1-800-262-8200 (CHEMTREC)

Section 2 - Hazards Identification

Iron Desulfurization Slag Fines is hazardous according to the criteria specified in European Directives 67/548/EEC and 1999/45/EC and OSHA 29 CFR 1910.1200 Hazard Communication Standard. 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 and are listed below. Refer to Section 3, 8 and 11 for additional information.

Hazard Classification	Hazard Category	Hazard Symbols	Signal Word	Hazard Statement
Acute Toxicity Hazard (covers Categories 1-5)	4		Warning	R22-Harmful if swallowed
Skin Irritation (covers Categories 1-3)	2		Warning	Causes skin irritation R38-Irritating to skin
Eye Damage/ Irritation (covers Categories 1, 2A and 2B)	1		Danger	Causes serious eye damage R41-Risk of serious damage to eyes
Specific Target Organ Systemic Toxicity (STOST) Following Single Exposure (covers Categories 1-3)	3		Warning	May cause respiratory irritation
STOST Following Repeated Exposure (covers Categories 1 and 2)	1		Danger	Causes damage to central nervous system

Precautionary Statement/Emergency Overview: Wash thoroughly after handling. Do not breathe dusts/fume/gas/mist/vapor/spray. Wear protective gloves and eye/face protection.

S23 – Do not breathe gas/fumes/vapor/spray. S24/25 – Avoid contact with skin and eyes. S 37/39 – Wear suitable gloves and eye/face protection.

Section 3 – Composition/Information on Ingredients

Chemical identity of the substance:

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

Iron Desulfurization Slag Fines

Section 3 – Composition/Information on Ingredients (continued)

EC- European Community

CAS - Chemical Abstract Service

Iron Desulfurization Slag Fines contains small amounts of various constituents in addition to those listed. These small quantities are frequently referred to as "trace" or "residual" constituents that generally originate in the raw materials used. Iron Desulfurization Slag Fines may contain the following trace or residual constituents: Silica (Quartz), phosphorus, titanium dioxide, sodium oxide, chromium (III) oxide, lead, arsenic, zinc, and potassium oxide.

Section 4 - First Aid Measures

Description of necessary first aid measures: Get medical attention if you feel unwell

- **Inhalation: IF INHALED:** Remove victim to fresh air and keep at rest in a position 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 soap and water. **If skin irritation occurs:** Get medical advice/attention. Take off contaminated clothing and wash before reuse.
- **Ingestion: IF SWALLOWED:** Call a POISON CENTER or doctor/physician if you feel unwell. Rinse mouth.

Most important acute and chronic symptoms/effects:

Primary Entry Routes: Excessive total particulate exposure may cause irritation to the eyes, skin and respiratory tract. Operations which generate high dust concentrations may result in the following effects if exposures exceed recommended limits as listed in Section 8.

Target Organs: Respiratory system, eyes, skin

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.

Acute Effects by component:

- **IRON OXIDE:** Contact with iron oxide has been reported to cause skin irritation and serious eye damage.
- **SILICA, FUSED:** Not Reported/ Not Classified
- **CALCIUM OXIDE:** Calcium oxide is an eye and skin irritant.
- **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.
- **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.

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. 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 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. Iron oxide is listed as a Group 3 (not classifiable) carcinogen by the International Agency for Research on Cancer (IARC).
- **SILICON/AMORPHOUS SILICA:** 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:** 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.
- **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.
- **ALUMINUM OXIDE (Al₂O₃):** Considered to be an inert or nuisance dust. Aluminum dusts/fines are a low health risk by inhalation and should be treated as a nuisance dust.
- **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. Worker populations exposed to MnO have had reports including: impairment of speed and coordination of motor function.
- **CARBON:** Chronic inhalation may lead to decreased lung function.

Iron Desulfurization Slag Fines

Section 4 - First Aid Measures (continued)

Chronic Effects (continued):

- **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.

Long-term inhalation exposure to high concentrations (over-exposure) of agents that produce lung disorders may act synergistically with inhalation of oxides, vapors or dusts of this product to cause toxic effects.

Carcinogenicity: This product is not listed by IARC, NTP or OSHA as a carcinogen. 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 airborne particulate matter exposure.

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

Section 5 – Fire and Explosion Hazard Information

Suitable 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.

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.

Explosion hazard: High concentrations of airborne metallic fines may present an explosion hazard.

Special protective equipment and precautions for fire fighters: Wear a self-contained breathing apparatus (SCBA) with a full face-piece operated in pressure-demand or positive pressure mode and full protective clothing.

Section 6 - Accidental Release Measures

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. Collect material in appropriate, labeled containers for recovery or disposal in accordance with federal, state, and local regulations.

Environmental precautions: Follow applicable federal, state, and local regulations

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

Precautions for safe handling: Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well ventilated area. 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.

Conditions for safe storage, including any incompatibilities: Store in a well ventilated place. Store away from acids and incompatible materials. Whenever feasible, store locked up.

Section 8 - Exposure Controls / Personal Protection

Occupational Exposure Limits (OELs):

Ingredients	OSHA PEL ¹	ACGIH TLV ²	NIOSH REL ³	IDLH ⁴
Iron Oxides	10 mg/m ³ (as iron oxide fume)	5.0 mg/m ³	5.0 mg/m ³ (as iron oxide dust and fume)	2,500 mg/m ³
Silica, Fused	10.0 mg/m ³ (%SiO ₂ +2) (as respirable fraction)	10 mg/m ³ (as inhalable fraction, ⁵ PNOS) ⁶ 3.0 mg/m ³ (as respirable fraction, ⁷ PNOS)	0.05 mg/m ³	NE
Calcium Oxide	5.0 mg/m ³	2.0 mg/m ³	2.0 mg/m ³	25 mg/m ³
Magnesium Oxide	15 mg/m ³	10 mg/m ³	NE	750 mg/m ³
Aluminum Oxide	15 mg/m ³ (as total dust, PNOR) ⁸ 5.0 mg/m ³ (as respirable fraction, PNOR)	10 mg/m ³	NE	NE
Manganese	"C" 5.0 mg/m ³ (as Fume & Mn compounds)	0.2 mg/m ³	"C" 5.0 mg/m ³ 1.0 mg/m ³ (as fume) "STEL" 3.0 mg/m ³	500 mg Mn/m ³
Carbon	15 mg/m ³ (as total dust, PNOR) 5.0 mg/m ³ (as respirable fraction, PNOR)	10 mg/m ³ (as inhalable fraction, PNOS) 3.0 mg/m ³ (as respirable fraction, PNOS)	NE	NE
Sulfur	15 mg/m ³ (total dust, PNOR) 5.0 mg/m ³ (as respirable fraction, PNOR)	10 mg/m ³ (as inhalable fraction, PNOS) 3.0 mg/m ³ (as respirable fraction, PNOS)	NE	NE

NE - None Established

Notes:

1. OSHA PEL (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.

Iron Desulfurization Slag Fines

Section 8 - Exposure Controls / Personal Protection (continued)

Notes (continued):

2. 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.
3. 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.
4. 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
5. 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 2009 TLVs^h and BEIs^h (Biological Exposure Indices) Appendix D, paragraph A.
6. PNOS (Particulates Not Otherwise Specified). Particulates identified under the PNOS heading are "nuisance dusts" containing no asbestos and <1% crystalline silica.
7. 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 2009 TLVs^h and BEIs^h Appendix D, paragraph C
8. PNOR (Particulates Not Otherwise Regulated). All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by a limit which is the same as the inert or nuisance dust limit of 15 mg/m³ for total dust and 5 mg/m³ for the respirable fraction.

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.

Personal Protective Equipment (PPE):

- **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 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.

Protective Clothing/Equipment:

- **Eyes:** Wear eye protection/face protection. A face shield should be used when appropriate to prevent contact with splashed materials. Chemical goggles, face shields or glasses should be worn to prevent eye contact. Contact lenses should not be worn where industrial exposure to this material is likely.
- **Skin:** Wear protective gloves. For operations, which in the generation of airborne particulates, use protective clothing to prevent skin contact. Take off contaminated clothing and wash before reuse. Contaminated work clothing should not be allowed out of the workplace.
- **Other protective equipment:** An eyewash fountain and deluge shower should be readily available in the work area.

Section 9 - Physical and Chemical Properties

Appearance and Odor: Gray/black solid, odorless

Odor Threshold: ND

Vapor Pressure at 20°C (68°F): NA

Vapor Density (Air = 1): NA

Formula Weight: ND

Density: ND

Specific Gravity (H₂O = 1, at 4°C): ND

pH: ND

Flash Point: ND

Auto-ignition Temperature: ND

Decomposition Temperature: ND

Partition Coefficient n-octanol/water: ND

Flammability (solid, gas): Not flammable

Explosive Properties: ND

NA - Not Applicable

ND - Not Determined for product as a whole

Water Solubility: ND

Fat Solubility: ND

Other Solubilities: ND

Boiling Point: ND

Viscosity: ND

Refractive Index: ND

Surface Tension: ND

% Volatile by volume: NA

Evaporation Rate: NA

Freezing Point: ND

Melting Point : ND

UEL: ND

LEL: ND

Oxidizing Properties: ND

Section 10 - Stability and Reactivity

Reactivity: Not Determined (ND) for product as a whole.

Stability: Iron Desulfurization Slag Fines is stable under normal storage and handling conditions.

Polymerization: Hazardous polymerization will not occur.

Chemical Incompatibilities: Iron oxide dusts in contact with calcium hypochlorite evolve oxygen and may cause an explosion.

Conditions to Avoid: Calcium oxide will react with water to form calcium hydroxide.

Hazardous Decomposition/Combustion Products: Oxides of carbon, metal oxides and toxic vapors may be releases at elevated temperatures.

Sensitivity to Mechanical Impact: ND

Sensitivity to Static Discharge: ND

Iron Desulfurization Slag Fines

Section 11 - Toxicological Information

The following toxicity data have been determined for **Iron Desulfurization Slag Fines** using the information available for its components applied to the guidance on the preparation of an SDS under the requirements of the GHS:

- a. No LC₅₀ or LD₅₀ has been established for **Iron Desulfurization Slag Fines** as a mixture. The following data has been determined for the components:
- **Iron Oxide:** LD₅₀ = >10,000 mg/kg (Oral/ Rat)
 - **Calcium Oxide:** LD₅₀ = >500 mg/kg but < 2000 mg/kg (Oral/ Rat)
 - **Aluminum Oxide:** LD₅₀ = >5,000 mg/kg (Oral/ Rat)
 - **Manganese:** Mn single oral exposures, LD₅₀ ranged from 275 to 804 mg/kg body weight per day for manganese chloride in different rat strains
 - **Sulfur:** LD₅₀ = 2500 mg/kg (Oral/Rabbit)
- b. No Skin Irritation data available for **Iron Desulfurization Slag Fines** as a mixture. The following Skin Irritation information was found for the components:
- **Iron Oxide:** Moderately irritating
 - **Calcium Oxide:** Causes human skin irritation with repeat exposures
 - **Magnesium Oxide:** Slight skin irritation noted in worker survey
- 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
 - **Calcium Oxide:** Risk of serious damage to eyes; human data
 - **Magnesium Oxide:** Slight eye irritation noted in worker survey
- d. 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
 - **Manganese:** Inconsistent results in genotoxicity tests
- e. No Carcinogenicity data available for **Iron Desulfurization Slag Fines** as a mixture. The following carcinogenicity information was found for the components:
- **Welding Fumes,** IARC Group 2B carcinogen, a mixture that is possibly carcinogenic to humans.
 - **Iron Oxide:** IARC-3, TLV-A4
 - **Silica, Amorphous:** IARC 3
- f. No Specific Target Organ Systemic Toxicity (STOST) Following Single Exposure data available for **Iron Desulfurization Slag Fines** as a mixture. The following STOST Following Single Exposure information 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.
- g. No Specific Target Organ Systemic Toxicity (STOST) Following Repeated Exposure data available for **Iron Desulfurization Slag Fines** as a mixture. The following STOST Following Repeated Exposure information was found for the components:
- **Manganese:** Neurobehavioral alterations in worker populations with Mn including: speed and coordination of motor function are especially impaired.
 - **Aluminum Oxide:** Chronic exposure to aluminum flake has been reported to cause pneumoconiosis in workers. Repeat oral exposure to aluminum results in decrements in neurobehavioral function and development.

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 2009, 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).

Section 12 - Ecological Information

Hazard Category: Not Reported

Hazard Symbol: No Symbol

Signal Word: No Signal Word

Hazard Statement: No Statement

Ecotoxicity: 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. Metal 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

Mobility: No Data Available

Persistence & Degradability: No Data Available

Bioaccumulative Potential: No Data Available

Note: The 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.

Section 13 - Disposal Considerations

Disposal: Dispose of contents/containers in accordance with federal, state and local 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.

Iron Desulfurization Slag Fines

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

US Department of Transportation (DOT) under 49 CFR 172 does not regulate **Iron Desulfurization Slag Fines** 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: Not Applicable (NA) Shipping Symbols: 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) Group: NA c) Authorization: NA	Quantity Limitations a) Passenger, Aircraft, or Railcar: NA b) Cargo Aircraft Only: No Limit Vessel Stowage Requirements a) Vessel Stowage: NA b) Other: NA DOT Reportable Quantities: NA
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The 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.

ADR – Regulations Concerning the International Carriage of Dangerous Goods by Road does not regulate **Iron Desulfurization Slag Fines** as a hazardous material.

Shipping Name: Not Applicable (NA) 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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IATA – International Air Transport Association (IATA) considers does not regulate **Iron Desulfurization Slag Fines** as a hazardous material.

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

Pkg Inst – Packing Instructions Max Net Qty/Pkg – Maximum Net Quantity per Package ERG – Emergency Response Drill Code

Transport Dangerous Goods (TDG) classification: **Iron Desulfurization Slag Fines** does not have a 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:

OSHA Regulations: Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-2, Z-3): The product, **Iron Desulfurization Slag Fines** as a whole is not listed. However, individual components of the product are listed: Refer to Section 8, Exposure Controls and Personal Protection.

EPA Regulations: **Iron Desulfurization Slag Fines** is listed as a whole on the TSCA Inventory. In addition, individual components of the product are listed:

Components	Regulations
Manganese	CAA, CERCLA, SARA 313

Regulations Key:

- CAA Clean Air Act (42 USC Sec. 7412; 40 CFR Part 61 [As of: 8/18/06]), No ingredients are listed.
- CERCLA Comprehensive Environmental Response, Compensation and Liability Act (42 USC secs. 9601(14), 9603(a); 40 CFR Sec. 302.4, Table 302.4, Table 302.4 and App. A)
- CWA Clean Water Act (33 USC secs. 1311; 1314(b), (c), (e), (g); 136(b), (c); 137(b), (c) [as of 8/2/06])
- RCRA Resource Conservation Recovery Act (42 USC Sec. 6921; 40 CFR Part 261 App VIII)
- SARA Superfund Amendments and Reauthorization Act of 1986 Title III Section 302 Extremely Hazardous Substances (42 USC secs. 11023, 13106; 40 CFR Sec. 372.65) and Section 313 Toxic Chemicals (42 USC secs. 11023, 13106; 40 CFR sec. 372.65 [as of 6/30/05])
- TSCA Toxic Substance Control Act (15 U.S.C. s/s 2601 et seq. [1976])
- SDWA Safe Drinking Water Act (42 U.S.C. s/s 300f et seq. [1974])

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

Section 313 Supplier Notification: This product, **Iron Desulfurization Slag Fines**, 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
7439-96-5	Manganese	2 max

This information should be included in all MSDSs that are copied and distributed for this material.

State Regulations: The product, **Iron Desulfurization Slag Fines**, 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: The product, **Iron Desulfurization Slag Fines**, contains regulated material in the following categories:

- Hazardous Substances: Iron Oxide, Calcium Oxide, Magnesium Oxide, and Sulfur
- Environmental Hazards: Manganese, Aluminum Oxide

Iron Desulfurization Slag Fines

Section 15 - Regulatory Information (continued)

State Regulations (continued):

California Prop. 65: The product, **Iron Desulfurization Slag Fines**, does not contain metallic elements known to the State of California to cause cancer or reproductive toxicity.

New Jersey: The product, **Iron Desulfurization Slag Fines**, contains regulated material in the following categories:

- Hazardous Substance: Iron Oxide, Calcium oxide, Silica(Fused), Manganese

Minnesota: Calcium Oxide, Magnesium Oxide, Manganese, and Aluminum Oxide

Massachusetts: Iron Oxide, Calcium Oxide, Silica(Fused), Manganese, Aluminum Oxide, and Sulfur

Other regulations: The product, **Iron Desulfurization Slag Fines**, as a whole may not be listed in other regulations. However, individual components of the product may be listed, check appropriate regulations for further regulatory compliance.

WHMIS Classification (Canadian): **Iron Desulfurization Slag Fines**, is not listed as a whole. However individual components are listed.

Ingredients	WHMIS Classification
Iron	B4, D2B
Calcium Oxide	E
Manganese	B4, D2A
Sulfur	B4, D2B

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

Section 16 - Other Information

Prepared By: United States Steel Corporation

Revision History:

05/10/11 – Update of content and format to comply with GHS

Hazardous Material Identification System (HMIS) Classification

Health Hazard	1
Fire Hazard	0
Physical hazards	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

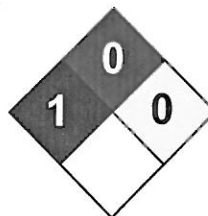
PHYSICAL HAZARDS = 0, Materials that are normally stable, even under fire conditions, and will not react with water, polymerize, decompose, condense, or self-react. Non-explosives.

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.

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.



Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet Kaolin MSDS

Section 1: Chemical Product and Company Identification

Product Name: Kaolin

Catalog Codes: SLK1183, SLK1066

CAS#: 1332-58-7

RTECS: GF1670500

TSCA: TSCA 8(b) inventory: Kaolin

CI#: Not available.

Synonym:

Chemical Name: Kaolin

Chemical Formula: H₂Al₂Si₂O₈·H₂O

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: 1-800-901-7247

International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Kaolin	1332-58-7	100

Toxicological Data on Ingredients: Kaolin LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of inhalation (lung irritant). Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, .

Potential Chronic Health Effects:

Slightly hazardous in case of ingestion. CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to upper respiratory tract, stomach. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact: Not available.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions: Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 2 (mg/m³) from ACGIH (TLV) [United States] [1999] Inhalation Respirable. TWA: 15 (mg/m³) from OSHA (PEL) [United States] Inhalation Total. TWA: 5 (mg/m³) from NIOSH Inhalation Respirable. TWA: 10 (mg/m³) from NIOSH [United States] Inhalation Total. TWA: 5 (mg/m³) from OSHA (PEL) [United States] Inhalation Respirable. Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Powdered solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 258.2 g/mole

Color: Off-white.

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: 1760°C (3200°F)

Critical Temperature: Not available.

Specific Gravity: 2.2 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess dust generation, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. May cause damage to the following organs: upper respiratory tract, stomach.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May cause adverse reproductive effects based on animal test data. No human data found.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Dust may cause skin irritation. Eyes: Dust may cause eye irritation. Ingestion: May cause irritation of the digestive tract. Low hazard for usual industrial handling. Inhalation: Dust may cause respiratory tract irritation. Low Hazard for usual industrial handling. Chronic Potential Health Effects: Prolonged exposure may affect the stomach and respiratory system. The NIOSH Pocket Guide lists the respiratory system and stomach as target organs. Chronic inhalation may cause a particular type of pneumoconiosis called Kaolinosis. It is characterized by positive x-ray findings and mild reductions in pulmonary function. Pure Kaolin is apparently not fibrogenic and does not induce debilitating silicosis. However, if it is contaminated with crystalline silica it may produce severe lung effects, including emphysema and pulmonary fibrosis due to the contaminating silica.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:

Illinois toxic substances disclosure to employee act: Kaolin Rhode Island RTK hazardous substances: Kaolin Pennsylvania RTK: Kaolin Minnesota: Kaolin Massachusetts RTK: Kaolin TSCA 8(b) inventory: Kaolin

Other Regulations: Not available.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

This product is not classified according to the EU regulations. S24/25- Avoid contact with skin and eyes. S28- After contact with skin, wash immediately with plenty of water. S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:20 PM

Last Updated: 05/21/2013 12:00 PM

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MATERIAL SAFETY DATA SHEET

MAGNESITE

1. Identification of the substance / preparation and the company / undertaking			
Product name :	Magnesite	Supplier :	Chamotte Holdings (Pty) Ltd 45 Lourens St, Halfway House South Africa
Synonyms :	Magnesium Carbonate	Manufacturer :	Chamotte Holdings (Pty) Ltd 45 Lourens St, Halfway House South Africa
Emergency telephone number :	+27 (0)11 805 1916		

2. Composition / Information on Ingredients				
Chemical Name	CAS No.	%	Symbol	R-Phrases
1. Magnesium Carbonate	546-93-0	94	MgCO ₃	

3. Hazards Identification	
Physical/Chemical Hazards :	Caution! May cause central nervous system depression. May cause cardiac disturbances. May cause eye and skin irritation. May cause respiratory and digestive tract irritation. If contains more than 1% crystalline silica, consult the relevant MSDS. Target Organs: None
Human Health Hazards:	May cause irritation during use. Avoid contact with eyes, skin, clothing. Wash thoroughly after handling.
Potential Health Effects	
Inhalation:	May cause respiratory tract irritation. Cough.
Ingestion:	May cause digestive tract irritation. Diarrhoea. Excess exposure can cause CNS depression and neurological and cardiac abnormalities.

NRDC - SETF ATTACHMENT EIGHT

5. Fire Fighting Measures	
General Information:	As in any fire, wear a self-contained breathing apparatus in pressure demand and full protective gear. Combustion generates toxic fumes.
Extinguishing Media:	Substance is non-combustible; use agent most appropriate to extinguish surrounding fire.

6. Accidental Release Measures	
General Information:	Use proper personal protective equipment as indicated in Section 8.
Spills and Leaks:	Sweep up or absorb the material, then place into suitable clean, dry, closed container for disposal. Avoid generating dusty conditions

7. Handling and Storage	
Handling:	Wash thoroughly after handling. Remove contaminated clothing and wash after reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with skin and eyes. Keep bags closed. Avoid ingestion and inhalation.
Storage:	Store in a closed bag. Store in a cool, dry, well-ventilated area away from incompatible substances.

8. Exposure Controls, Personal Protection		
Engineering Controls:	Use adequate and general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.	
Hygiene Measures:	Wash hands, forearms, and face thoroughly after handling compounds and before eating, smoking, using lavatory, and at the end of the day.	
Occupational Exposure Limits:	Chemical Name	Occupational Exposure Limit
	Magnesium Carbonate	10mg/m ³ TWA
Personal Protective Equipment:		
Eyes:	Wear appropriate eyeglasses or chemical safety goggles.	
Skin:	Wear appropriate gloves to prevent skin exposure.	
Clothing:	Wear appropriate clothing to prevent skin exposure.	
Respirator:	Use appropriate dust respirator.	

9. Physical and Chemical Properties	
Physical State:	Solid
Appearance:	White
Odour:	None reported
pH:	Not available
Vapour pressure:	Negligible.

10. Stability and Reactivity	
Chemical Stability:	Stable under normal temperatures and pressures
Conditions to avoid:	Incompatible materials, excess heat
Incompatibilities with other materials:	Acids and formaldehydes
Hazardous decomposition Products:	Carbon dioxide, oxides of magnesium
Hazardous Polymerisation:	Has not been reported

11. Toxicological Information	
Carcinogenic Effects:	Not Listed by ACGIH, IARC, NIOSH, NTP, OSHA
Epidemiology:	No information available
Teratogenicity:	No information available
Reproductive Effects:	No information available
Neurotoxicity:	No information available
Mutagenicity:	No information available

12. Ecological Information	
Ecotoxicity:	No information available
Environmental Fate:	No information available

13. Disposal Considerations	
Methods of disposal:	Waste must be disposed of in accordance with local environmental control regulations.

14. Transport Information	
Land:	Not regulated as a hazardous material
Sea:	Not regulated as a hazardous material
Air:	Not regulated as a hazardous material

15. Regulatory Information	
European / International:	
Hazard symbols:	Not available
Risk Phrases:	Not available
Safety Phrases:	S 24/25 Avoid contact with skin and eyes

Notice to Reader:



2710 Wycliff Road
 Raleigh, North Carolina 27607
 919-781-4550

MATERIAL SAFETY DATA SHEET

Effective Date: 11-07
 Replaces: 8-03

I - PRODUCT AND COMPANY IDENTIFICATION		
PRODUCT NAME Quartzite	CHEMICAL FORMULA Mixture	MOLECULAR WEIGHT Not Applicable
TRADE NAME Crushed Stone, Ballast		
SYNONYMS Aggregate, Ballast, Manufactured Sand		DOT IDENTIFICATION NO. None

II - COMPOSITION/INFORMATION ON INGREDIENTS				
COMPONENT(S) CHEMICAL NAME	CAS REGISTRY NO	% by weight (approx)	MSHA/OSHA PEL	ACGIH TLV-TWA
Silicon Dioxide, SiO ₂	14808-60-7	40-75	(R) 10 mg/m ³ / (% SiO ₂ +2) [§]	(R) 0.025 mg/m ³
Aluminum Oxide, Al ₂ O ₃	1344-28-1	12-20	(T) 15 mg/m ³ , (R) 5 mg/m ³	#10 mg/m ³
Ferrous Oxide, FeO	1345-25-1	< 10	-	5 mg/m ³
Ferric Oxide, Fe ₂ O ₃	1309-37-1	< 4	10 mg/m ³	5 mg/m ³
Magnesium Oxide, MgO	1309-48-4	< 8	15 mg/m ³	10 mg/m ³
Calcium Oxide, CaO	1305-78-8	< 11	5 mg/m ³	2 mg/m ³
Sodium Oxide, Na ₂ O	1313-59-3	< 8	-	2 mg/m ³ as NaOH
Potassium Oxide, K ₂ O	12136-45-7	< 8	-	-
Titanium Oxide, TiO ₂	13463-67-7	< 1	15 mg/m ³	10 mg/m ³

*: The composition of SiO₂ may be up to 100% crystalline silica. (R): Respirable (T): Total §: Crystalline silica is normally measured as respirable dust. The OSHA standard also presents a formula for calculation of the PEL based on total dust: 30 mg/m³ / (% SiO₂+2). #: Particulate matter containing no asbestos and <1% crystalline silica.

III - HAZARDS IDENTIFICATION	
<p>Quartzite is a mixture of angular or round multicolored particles from powder to boulders. It is odorless and not flammable. Respirable dust particles containing silicon dioxide may be generated by handling quartzite. Inhalation of excessive particulate matter may cause respiratory problems. Crystalline silica, a component of this product, has been designated as a Group I carcinogen by IARC.</p>	
<p>Health Effects: The information below represents an overview of health effects caused by overexposure to one or more components in quartzite. The individual effects are described in Section XI.</p>	
Primary routes(s) of exposure:	<input checked="" type="checkbox"/> Inhalation <input type="checkbox"/> Skin <input type="checkbox"/> Ingestion
EYE CONTACT:	Direct contact with dust may cause irritation by mechanical abrasion. Conjunctivitis may occur.
SKIN CONTACT:	Direct contact may cause irritation by mechanical abrasion. Some components of material are also known to cause mild corrosive effects to skin and mucous membranes.
SKIN ABSORPTION:	Not expected to be a significant route of exposure.

INGESTION: Small amounts (a tablespoonful) swallowed during normal handling operations are not likely to cause injury. Ingestion of large amounts may cause gastrointestinal irritation and blockage.

INHALATION: Dust may irritate nose, throat, mucous membranes, and respiratory tract by mechanical abrasion. Coughing, sneezing, chest pain, shortness of breath, inflammation of mucous membrane, and flu-like fever may occur following exposures in excess of appropriate exposure limits. Repeated excessive exposure may cause pneumoconiosis, such as silicosis and other respiratory effects.

Notes on Silicosis:

Use of quartzite for construction purposes is not believed to cause acute toxic effects. Repeated overexposures to respirable crystalline silica (quartz, cristobalite, tridymite) for periods as short as 6 months has caused acute silicosis.

Symptoms of acute silicosis include (but are not limited to): shortness of breath, cough, fever, weight loss, and chest pain. Acute silicosis is a rapidly progressive, incurable lung disease and is typically fatal.

Chronic exposure to respirable quartz-containing dust in excess of appropriate exposure limits has caused silicosis, a progressive pneumoconiosis (lung disease). Restrictive and/or obstructive lung function changes may result from chronic exposure. Chronic tobacco smoking may further increase the risk of developing chronic lung problems.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Inhaling respirable dust and/or crystalline silica may aggravate existing respiratory system disease(s) and/or dysfunctions. Exposure to dust may aggravate existing skin and/or eye conditions. Smoking and obstructive / restrictive lung diseases may also exacerbate the effects of excessive exposure to this product.

IV - FIRST AID MEASURES

EYES: Immediately flush eye(s) with plenty of clean water for at least 15 minutes, while holding the eyelid(s) open. Occasionally lift the eyelid(s) to ensure thorough rinsing. Beyond flushing, do not attempt to remove material from the eye(s). Contact a physician if irritation persists or develops later.

SKIN: Wash with soap and water. Contact a physician if irritation persists or develops later.

INGESTION: If person is conscious, give a large quantity of water and induce vomiting; however, never attempt to make an unconscious person drink or vomit. Get medical attention.

INHALATION: Remove to fresh air. Dust in throat and nasal passages should clear spontaneously. Contact a physician if irritation persists or develops later.

V - FIRE FIGHTING MEASURES

FLASHPOINT
Not flammable

FLAMMABLE LIMITS IN AIR
Not flammable

EXTINGUISHING AGENT
None required

UNUSUAL FIRE AND EXPLOSION HAZARD
Contact with powerful oxidizing agents may cause fire and/or explosions (see Section X of this MSDS).

VI - ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Persons involved in cleaning should first follow the precautions defined in Section VII of the MSDS. Spilled materials, where dust can be generated, may overexpose cleanup personnel to respirable quartz-containing dust. Wetting of spilled material and/or use of respiratory protective equipment may be necessary. Do not dry sweep spilled material.

This product is not subject to the reporting requirements of Title III of SARA, 1986, and 40 CFR 372.

VII – HANDLING AND STORAGE

This product is not intended or designed for, and should not be used as an abrasive blasting medium or for foundry applications.

Follow protective controls set forth in Section VIII of this MSDS when handling this product.

Respirable quartz-containing dust may be generated during processing, handling and storage. Do not breathe dust. Avoid contact with skin and eyes.

Do not store near food or beverages or smoking materials.

Do not stand on piles of materials; it may be unstable.

VIII – EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS

Ventilation: Use local exhaust, general ventilation or natural ventilation adequate to maintain exposures below appropriate exposure limits. If a person breathes large amounts of this material, move the exposed person to fresh air at once; other measures are usually unnecessary.

Other control measures: Respirable dust and quartz levels should be monitored regularly. Dust and quartz levels in excess of appropriate exposure limits should be reduced by all feasible engineering controls, including (but not limited to) dust suppression (wetting), ventilation, process enclosure, and enclosed employee work stations.

EYE/FACE PROTECTION

Safety glasses with side shields should be worn as minimum protection. Dust goggles should be worn when excessively (visible) dusty conditions are present or are anticipated. If product contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this material.

SKIN PROTECTION

No personal protection recommended.

RESPIRATORY PROTECTION

Respirator Recommendations:

For respirable quartz levels that exceed or are likely to exceed appropriate exposure limits, a NIOSH-approved 100 series particulate filter respirator must be worn. If respirable quartz levels exceed or are likely to exceed an 8 hour-TWA of 0.5 mg/m³, a NIOSH-approved air purifying, full-face respirator with a 100 series particulate filter must be worn. Respirator use must comply with applicable MSHA or OSHA standards, which include provisions for a user training program, respirator repair and cleaning, respirator fit testing, and other requirements. For additional information contact NIOSH at 1-800-356-4674.

Emergency or planned entry into unknown concentrations or IDLH conditions: Any self-contained breathing apparatus that has a full-face piece and is operated in a pressure-demand or other positive-pressure mode or any supplied-air respirator that has a full-face piece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus.

Escape from unknown or IDLH conditions: Any air-purifying, full-face piece respirator with a high-efficiency particulate filter or any appropriate escape-type, self-contained breathing apparatus.

GENERAL HYGIENE CONSIDERATIONS

There are no known hazards associated with this material when used as recommended. Following the guidelines in this MSDS are recognized as good industrial hygiene practices. Avoid breathing dust. Avoid skin and eye contact. Wash dust-exposed skin with soap and water before eating, drinking, smoking, and using toilet facilities. Wash work clothes after each use.

IX - PHYSICAL AND CHEMICAL PROPERTIES	
APPEARANCE, ODOR AND PHYSICAL STATE Angular or round multicolored particles ranging in size from powder to boulders; odorless. Solid material.	SPECIFIC GRAVITY 2.55 - 2.80
BOILING POINT Not Applicable	VAPOR DENSITY IN AIR (AIR = 1) Not Applicable
VAPOR PRESSURE 0	% VOLATILE, BY VOLUME 0%
EVAPORATION RATE 0	SOLUBILITY IN WATER Negligible

X - STABILITY AND REACTIVITY	
STABILITY Stable	CONDITIONS TO AVOID Contact with incompatible materials (see below).
INCOMPATIBILITY (Materials to avoid) Contact with powerful oxidizing agents such as fluorine, boron trifluoride, chlorine trifluoride, manganese trifluoride, and oxygen difluoride may cause fire and/or explosions. Silica dissolves in hydrofluoric acid producing a corrosive gas -- silicon tetrafluoride.	
HAZARDOUS DECOMPOSITION PRODUCTS Silica containing respirable dust particles may be generated by handling quartzite.	

XI - TOXICOLOGICAL INFORMATION
<p>This product is a mixture of components. The composition percentages are listed in Section II. Toxicological information for each component is listed below:</p> <p>Silicon Dioxide: It is comprised of amorphous and crystalline forms of silica. In some batches, crystalline silica may represent up to 100% of silicon dioxide.</p> <p>Respirable crystalline silica (quartz): ACGIH TLV= 0.025 mg/m³ MSHA and OSHA PEL: Crystalline quartz (respirable): PEL-TWA 10 mg/m³ (%SiO₂ + 2). Cristobalite: Use ½ the value calculated from the count or mass formulae for quartz. Tridymite: Use ½ the value calculated from the formulae for quartz.</p> <p>Other Particulates: TLV = 10 mg/m³ (inhalable/total particulate, not otherwise classified), TLV = 3 mg/m³ (respirable particulate, not otherwise classified), OSHA PEL = 15 mg/m³ (total particulate, not otherwise regulated), OSHA PEL = 5 mg/m³ (respirable particulate, not otherwise regulated)</p> <p>ACGIH, MSHA, and OSHA have determined that adverse effects are not likely to occur in the workplace provided exposure levels do not exceed the appropriate exposure limits. Lower exposure limits may be appropriate for some individuals including persons with pre-existing medical conditions such as those described below.</p> <p>MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE Inhaling respirable dust and/or crystalline silica may aggravate existing respiratory system disease(s) and/or dysfunctions. Exposure to dust may aggravate existing skin and/or eye conditions. Occupational exposure to free silica is known to produce silicosis, a chronic, disabling lung disease characterized by the formation of silica-containing nodules of scar tissue in the lungs.</p>

Simple silicosis, in which the nodules are less than 1 cm in diameter is generally asymptomatic but can be slowly progressive, even in the absence of continued exposure.

Silicosis leads to conditions such as lung fibrosis and reduced pulmonary function. The form and severity in which silicosis manifests itself depends in part on the type and extent of exposure to silica dusts: chronic, accelerated and acute forms are all recognized. In later stages the critical condition may become disabling and potentially fatal. Restrictive and/or obstructive changes in lung function may occur due to exposure. A risk associated with silicosis is development of pulmonary tuberculosis (silico-tuberculosis). Respiratory insufficiencies due to massive fibrosis and reduced pulmonary function, possibly with accompanying heart failure, are other potential causes of death due to silicosis.

Symptoms of Silicosis: Not all individuals with silicosis will exhibit symptoms (signs) of the disease. However, silicosis can be progressive, and symptoms may potentially appear years after exposures have ceased. Symptoms of silicosis may include (but are not limited to): Shortness of breath; difficulty breathing with or without exertion; coughing; diminished work capacity; diminished chest expansion; reduction of lung volume; heart enlargement and/or failure.

Respirable dust containing newly broken particles has been shown to be more hazardous to animals in laboratory tests than respirable dust containing older silica particles of similar size. Respirable silica particles which had aged for sixty days or more showed less lung injury in animals than equal exposures of respirable dust containing newly broken pieces of silica.

There are reports in the literature indicating that crystalline silica exposure may be associated with adverse health effects involving the kidney, scleroderma (thickening of the skin caused by swelling and thickening of fibrous tissue) and other autoimmune and immunity-related disorders. Several studies of persons with silicosis or silica exposure also indicate or suggest increased risk of developing lung cancer, a risk that may increase with the duration of exposure. Many of these studies of silicosis do not account for lung cancer confounders, especially smoking. In October 1996, an IARC Working group re-assessing crystalline silica, a component of this product, designated crystalline silica as a human carcinogenic (Group 1 carcinogen). The NTP indicates that crystalline silica is reasonably anticipated to be a human carcinogen (Group 2). These classifications are based on sufficient evidence of carcinogenicity in certain experimental animals and epidemiological studies of workers exposed to crystalline silica. Crystalline silica in October 1996 was listed on the Safe Drinking Water and Toxic Enforcement ACT of 1986 (California Proposition 65) as a chemical known to the state to cause cancer or reproductive toxicity.

Aluminum Oxide:

Exposure route: Eyes, skin, inhalation.

Target organs: Eyes, skin, respiratory system.

Acute effect: Animal studies with α -alumina were reported in 1941. This study found that alumina particles well below 40 μm in diameter produced a "nuisance particulate" reaction in animals. Very fine Al_2O_3 powder was not fibrogenic in rats, guinea pigs, or hamsters when inhaled for 6 to 12 months and sacrificed at periods up to 12 months following the last exposure.

Chronic effect/carcinogenicity: Aluminum oxide is not classifiable as to human carcinogen potential. Epidemiologic surveys have indicated an excess of nonmalignant respiratory disease in workers exposed to aluminum oxide during abrasives production.

Ferric Oxide:

Exposure route: Inhalation.

Target organs: Respiratory system.

Acute effect: Benign pneumoconiosis with X-ray shadows indistinguishable from fibrotic pneumoconiosis. Experimental work in animals exposed by intratracheal injection or by inhalation to iron oxide mixed with less than 5% silica has shown no evidence of fibrosis produced in lung tissue.

Chronic effect/carcinogenicity: It is not generally accepted that inhalation or dermal exposure to iron oxide dust or fume poses a carcinogenic risk to human beings. Not classifiable as to human carcinogen potential.

Ferrous Oxide:

Exposure route: Ingestion, inhalation, skin.

Target organs: Respiratory system, skin, eyes, neurological system.

Acute effect: Major findings: stupor, shock, acidosis, hematemesis, bloody diarrhea or coma. Minor findings: vomiting, diarrhea, mild lethargy.

Chronic effect/carcinogenicity: Irritability, nausea or vomiting, and normocytic anemia. When exposed to levels greater than 50 to 100 milligram per day, it can result in pathological deposition of iron in the body tissues causing fibrosis of the pancreas, diabetes mellitus, and liver cirrhosis. Not classifiable as to human carcinogen potential.

Magnesium Oxide:

Exposure route: Inhalation, eye/skin contact.

Target organs: Eyes, respiratory system.

Acute effect: Magnesium oxide dust caused slight irritation of the eyes and nose, conjunctivitis, inflammation of the mucous membrane, and coughing up discolored sputum after industrial exposures amongst workers exposed to an unspecified concentration of MgO. Acute toxicity causes nausea, malaise, general depression and paralysis of respiratory, cardiovascular and central nervous system.

Experiments with cats exposed to freshly formed MgO (magnesium ranging from 21 to 156 mg) fumes plus 10% carbon dioxide showed uniform but slight hypothermia. These animals rapidly returned to normal and showed no subsequent ill effect upon cessation of MgO inhalation.

Chronic effect/carcinogenicity: NIOSH has indicated that there may be a carcinogenic risk from exposure to MgO dust.

Calcium Oxide:

Exposure route: Inhalation, ingestion, skin/eye contact.

Target organs: Eyes, skin, respiratory system.

Acute effect: Direct contact of CaO with tissues, can result in burns and severe irritation because of its high reactivity and alkalinity. Major complaints of workers exposed to lime consist of irritation of the skin and eyes, although inflammation of the respiratory passages, ulceration and perforation of the nasal septum, and even pneumonia has been attributed to inhalation of the dust.

Chronic effect/carcinogenicity: Not classifiable as to human carcinogen potential.

Sodium Oxide:

Exposure route: Inhalation, ingestion, skin/eye contact.

Target organs: Eyes, skin, respiratory system.

Acute effect: Corrosive – causes burns, irritation of skin, eyes, respiratory tract, extremely destructive of mucous membranes.

Chronic effect/carcinogenicity: Not classifiable as to human carcinogen potential.

Potassium Oxide

Exposure route: Inhalation, ingestion, skin/eye contact.

Target organs: Eyes, skin, respiratory system.

Acute effect: If inhaled, causes sore throat, cough, burning sensation and shortness of breath. Contact with skin produces pain and blisters. Severe deep burns, redness and pain occur with eye contact. Ingestion of K₂O results in burning sensations, abdominal pain, shock or collapse.

Chronic effect/carcinogenicity: Not classifiable as to human carcinogen potential.

Titanium Oxide:

Exposure route: inhalation.

Target organs: respiratory system.

Acute effect: Toxicological studies have concluded that titanium oxide is inert, not absorbed by the body, and exerts no toxic effect.

Chronic effect/carcinogenicity: Currently not classifiable as a human carcinogen potential (In consideration by IARC to be classified as Group 2B-possibly carcinogenic to humans).

XII – ECOLOGICAL INFORMATION

No data available

XIII – DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD

Collect and reuse clean materials. Dispose of waste materials only in accordance with applicable federal, state, and local laws and regulations.

XIV – TRANSPORT INFORMATION

DOT HAZARD CLASSIFICATION

None

PLACARD REQUIRED

None

LABEL REQUIRED

Label as required by the OSHA Hazard Communication standard (29 CFR 1910.1200(f)), and applicable state and local regulations.

XV – REGULATORY INFORMATION

Crystalline silica, a major component of this product, is on the NTP and IARC carcinogen lists, but not on the OSHA carcinogen list. In October 1996, an IARC Working group re-assessing crystalline silica, a component of this product, designated crystalline silica as a human carcinogen (Group 1 carcinogen).

Crystalline silica in October 1996 was listed on the Safe Drinking Water and Toxic Enforcement ACT of 1986 (California Proposition 65) as chemical known to the state to cause cancer or reproductive toxicity.

XVI – OTHER INFORMATION

ACGIH: American Conference of Governmental Industrial Hygienists
CFR: US Code of Federal Regulations
DOT: US Department of Transportation
IARC: International Agency for Research on Cancer
IDLH: Immediately Dangerous to Life and Health
NIOSH: National Institute for Occupational Safety and Health, US Department of Health and Human Services
NTP: National Toxicology Program
OSHA: Occupational Safety and Health Administration, US Department of Labor
PEL: Permissible Exposure Limit
SARA Title III: Title III of the Superfund Amendments and Reauthorization Act, 1986
TLV: Threshold Limit Value
TWA: Time-weighted Average

FOR FURTHER INFORMATION	CONTACT:	Martin Marietta Aggregates Manager-Safety 2710 Wycliff Road Raleigh, NC 27607 919/781-4550 HOURS?
DATE OF PREPARATION 11/07		

NOTICE: Martin Marietta Materials believes that the information contained on this Material Safety Data Sheet is accurate. The suggested precautions and recommendations are based on recognized good work practices and experience as of the date of publication. They are not necessarily all-inclusive nor fully adequate in every circumstance as not all use circumstances can be anticipated. Also, the suggestions should not be confused with nor followed in violation of applicable laws, regulation, rules or insurance requirement. However, product must not be used in a manner which could result in harm.

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