The David J. Joseph Company

Metals Group

Section 1: IDENTIFICATION OF PRODUCT AND COMPANY

Product Name:	Ferrosilicon	**Chemical Formula:**	FeSi
Synonyms:	None	**CAS Number:**	8049-17-0

Product Lines Covered:	FeSi [40%, 50%, 65%, 75%, 85%] Regular, Low Al, 0.10 Low Al, High Purity, Ultra High Purity, Foundry Grade, Calsifer, Low Carbon, w/Manganese, w/Boron, Fines, Briquettes; Silgran 50, Silgran 75, Crusher Dust, FeSi Unstabilized.
Manufacturer/Supplier:	David J. Joseph Company 300 Pike St Cincinnati, OH 45202
Non-Emergency Contact:	DJJ Safety Department
Non-Emergency Phone Number:	(513) 419-6200
Emergency Contact:	DJJ
Emergency Phone Number:	(513) 561-1699
Product Application:	Metallurgical additive for Steel and Iron Foundry production

Section 2: HAZARDS IDENTIFICATION

Hazard Classification:	The product does not meet the criteria for hazard classification in accordance with Regulation (EC) No 1272/2008 (CLP) or OSHA HCS-2012/(GHS).
Signal Word:	N/A (Not Applicable)
Hazard Symbol/Pictogram/Letter:	N/A (Not Applicable)
S and P Phrases:	N/A (Not Applicable)
R and H Phrases:	N/A (Not Applicable)

Flammable and/or noxious gases may be formed when product is in contact with moisture, acids, or bases, per Sections 10 and 11. Keep away from oxidizing agents and halogen acids. Ferrosilicon dust (minus 200 Mesh) suspended in air may, under certain conditions, cause dust explosions, per Section 10. Avoid breathing dust, as it may irritate and dehydrate mucous membranes.

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients	Weight%	CAS #	Index #	EINECS/EC #
Ferrosilicon (FeSi)	100%	8049-17-0		912-631-7
Chemical Composition:				
Carbon (C)	<0.20	7440-44-0		231-153-3
Aluminum (Al)	0.0-2.0	7429-90-5		231-072-3
Silicon (Si)	40.0-90.0	7440-21-3		231-130-8
Calcium (Ca)	0.0-2.0	7440-70-2		231-179-5
Titanium (Ti)	<0.25	7440-32-6		231-142-3
Vanadium (V)	<0.10	7440-62-2		231-171-1
Chromium (Cr)	<0.50	7440-47-3	024-017-00-8	231-157-5
Manganese (Mn)	<1.0	7439-96-5		231-105-1
Iron (Fe)	10.0-55.0	7439-89-6		231-096-4
Copper (Cu)	<0.30	7440-50-8		231-159-6
Nickel (Ni)	<0.20	7440-02-0	028-002-00-7	231-111-4

Section 4: FIRST AID MEASURES

Inhalation: Remove to fresh air, irritation may be caused by dust. Seek medical attention for persistent feeling of discomfort, or for Phosphine/Arsine intoxication [See Section 11].

Skin Contact: Wash skin with water and/or mild soap.

Eye Contact: Rinse eyes with water/saline solution. Seek medical attention if irritation persists.

Ingestion: Remove person from dust-exposed area. See inhalation measures.

Section 5: FIRE FIGHTING MEASURES

Fire Extinguishing Media: Dry sand, CO_2, or dry powder. Ferrosilicon in lump and granular form is not combustible.

Special Information: Ferrosilicon in dust form, at minus 200 Mesh size, is weakly combustible [See Section 10].

Section 6: ACCIDENTAL RELEASE MEASURES

Material in the form of dust should be collected in suitable containers. Damp product must be kept away from dry product, and must not be collected and stored in sealed/closed containers; use a dry, vented container for the damp material. Dry material can be swept or vacuumed up. Wear PPE as specified in Section 8.

Section 7: HANDLING AND STORAGE

Handling: Avoid handling that generates dust buildup. Avoid inhalation of dust [See Section 8]. Avoid ignition sources (e.g. hot work, welding) in areas with high dust concentrations. Addition of wet material to molten metal may cause explosion [See section 10].

Storage: Keep product in dry, well ventilated areas, and away from acids and bases.

Inadequate Ventilated Containers: It is advised to allow 15 minutes to ventilate naturally with fully open doors to allow fresh air to enter a container prior to unloading/stripping the container. Containers should preferably be opened outdoors in an area protected from moisture. In case of the need to immediately strip/unload containers (less than 15 minutes), always wear a full face mask respirator with a gas/vapor canister per standard EN 14387 while unloading.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Personal Protective Equipment (PPE):

Eye Protection:	ANSI-rated safety glasses with side shields; eyewash facilities.
Respiratory Protection:	For exposure to dust that may exceed exposure limits, wear an appropriate, NIOSH-approved respirator (N-95 or P-100 dust mask), in accordance with the following, pertinent standards: 29 CFR 1910.134, CSA Standard Z94.4-M1982, or EN 149 FFP 2S.
Skin Protection:	Suitable protective gloves and clothing for handling lump material with possible sharp edges.
Ventilation:	A well ventilated work/storage area (local exhaust, when necessary, to achieve dust control, ventilation, and adequate air exchanges in closed spaces). If exposure to Phosphine and/or Arsine is suspected [See Section 10], or if adequate ventilation for air exchanges is not possible (storage holds, bunkers, etc), then a self-contained breathing apparatus or a supplied air respirator is recommended. For immediate opening/striping in inadequately ventilated containers, wear PPE as stated in Section 7.

Occupational Airborne Exposure Limits:

	OSHA PEL (8 hr. TWA mg/m^3)	ACGIH TLV® (8 hr. TWA mg/m^3)	15 minute STEL (mg/m^3)
Total Inhalable Dust	15	10	-
Respirable Dust	5	3	-
Phosphine gas (PH_3) (7803-51-2)	0.4	0.14	0.28
Arsine gas (AsH_3) (7784-42-1)	0.2	0.01	-

The low occupational exposure limit for Arsine gas is due to the evidence for carcinogenicity in humans of inorganic Arsenic compounds in general (IARC). Exposure levels for dust do not cover possible Arsine/Phosphine absorption from dust deposited on mucous membranes.

DNEL (Derived No Effect Level) and PNEC (Predict No Effect Concentration):

DNEL-Inhalable mg/m^3	DNEL-Respirable mg/m^3	PNEC-Inhalable mg/m^3	PNEC-Respirable mg/m^3
4.0 (determined as Si)	0.3 (determined as Si)	Not relevant	Not Relevant

Environmental Exposure Controls (* = Not to be exceeded more than 35 time a calendar year):

	Averaging period	Limit/Target values	By date
PM_{10}	One day	Limit-50 µg/m^3*	01/01/2005
PM_{10}	Calendar year	Limit-40 µg/m^3	01/01/2005
$PM_{2.5}$	Calendar year	Target-25 µg/m^3	01/01/2010
$PM_{2.5}$	Calendar year	Limit-25 µg/m^3	01/01/2010

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance/Form:	Silver-gray; lump, granular, powder	**Upper/lower flammability or explosive limits:**	Lowest explosive limit is +/- 60mg/ m^3
Odor:	Odorless	**Vapor pressure:**	N/A
Odor threshold:	N/A	**Vapor density:**	N/A
pH:	See solubility	**Relative density:**	2.5-7.3 g/cm^3
Melting point (^{O}F):	2205-2520	**Solubility (Water):**	15ug Si/l at pH 5.8 (OECD 105), diameter < 1 mm
Specific gravity (Water = 1.0):	2.7-5.1	**Partition coefficient: n-octanol/water:**	N/A
Initial boiling point/boiling range:	N/A	**Auto-ignition temp:**	> 400 ^{o}C (EU Method A.16)
Flash point:	N/A	**Decomposition temp:**	N/A
Evaporation rate:	N/A	**Viscosity:**	N/A
Flammability (solid only):	No ignition	**Oxidizing properties:**	N/A

Section 10: STABILITY AND REACTIVITY

Reactivity: Not reactive at normal temperatures and pressures

Stability: Stable under normal storage conditions [See Section 7]

Conditions to Avoid: Contact with moisture during storage/handling. Sparks/ignition sources (e.g. hot work, welding) in areas with high dust concentrations. Ferrosilicon dust particles (minus 200 Mesh) suspended in air at concentrations higher than 100-300g/m3 have the potential to cause dust explosions. At a given particle size, ignition sensitivity and explosive force decrease as the ratio Si:Fe decreases. Dust at particle size of >10um and Si:Fe ratio ≤ 2 is not considered an explosion danger. Adding wet material to molten metal, especially pouring molten metal onto wet material, may cause an explosion.

Materials to Avoid/Incompatibles: Water/humidity, acids, bases.

Hazardous Decomposition Products: Highly flammable Hydrogen gas (H_2) and highly flammable and highly toxic gases Phosphine and Arsine (garlic-like odor), both of which are heavier than air, may evolve if Ferrosilicon comes into contact with moisture, acids, or bases. A prerequisite for phosphine and arsine gas formation is the presence of reactive phosphides or arsenides, such as e.g. Ca_3P_2 or Ca_3As_2 at the alloy phase-boundaries inside the alloy. Very low levels of P (< 0.02%) and As (< 0.0005% detection limit) in FeSi, in combination with rapid solidification that limits segregation of the alloying elements, effectively minimize the formation of such compounds and thus the probability of gas formation. Phosphine (PH_3) and arsine (AsH_3) are both heavier than air and may concentrate at the bottom of closed containers. Densities (25 °C, 1 atm), PH_3: 1.379 g/l, AsH_3: 1.321 g/l, air: 1.225 g/l. A reaction with Hydrofluoric Acid (HF) or Nitric Acid (HNO_3) leads to evolution of toxic gases such as Silicon Tetrafluoride (SiF_4) or Nitrous gas species (NO_x). In the presence of moisture, small amounts of occluded Carbidic slag may evolve Acetylene, with trace amounts of Hydrogen Sulfide (H_2S). Wet Ferrosilicon will form highly flammable Hydrogen gas (H) if added to molten metal, due to water decomposition.

Section 11: TOXICOLOGICAL INFORMATION

Potential Health Effects: Exposure OSHA PEL's and ACGIH TLV's ®for ingredients and reaction products are specified in Section 3 and Section 8. There are no OSHA PEL's or ACGIH TLV's ®established, nor LC_{50} or LD_{50} established, for the product. The product does not meet the criteria for hazard classification according to Directive 1999/45/EC (DPD) and Regulation (EC) No1272/2008 (CLP). The product may contain trace amounts of Nickel. The International Agency for Research on Cancer (IARC) has determined that Nickel and certain Nickel compounds are "probably carcinogenic to humans", but the nickel compounds responsible for the effect have not been specified. It does contain the metallic form of Chromium, in trace amounts. The IARC has determined that hexavalent Chromium and certain hexavalent Chromium compounds are "casually associated with cancer in humans", but "the compounds responsible for the carcinogenic effect in humans cannot be specified".

Acute Effects:

Inhalation: None in lump form. Dust may irritate/dehydrate mucous membranes. Phosphine/Arsine gas may be absorbed from dust deposited on mucous membranes. Toxic mechanism of these gases not well understood, but they can irritate mucous membranes, depress the central nervous system, and cause edema of lungs. Temporary effects may include headache, malaise, vomiting, stomach

pain, coughing, and breathing difficulties. Symptomatic treatment: corticosteroids, prophylactic for edema of the lungs.

Skin Contact: Dust may irritate the skin.

Eye Contact: Dust may irritate eyes and lead to dry eyes.

Ingestion: Dust may irritate and dehydrate mucous membranes. Possible Phosphine/Arsine absorption.

Chronic Effects: No adverse, chronic effects are expected, based on review of available scientific literature and facility history, nor is an increased mortality history or increased incidence of cancer indicated. Prolonged exposure to Phosphine may lead to chronic effects, such as difficulty with movement and speech problems.

Section 12: ECOLOGICAL INFORMATION

The product is not characterized as dangerous for the environment.

Material is inorganic and insoluble. It does not meet the classification criteria for ecotoxilogical endpoints in accordance with Directive 1999/45/EC (DPD) and Regulation (EC) 1272/2008 (CLP).

Persistence/degrade: Not relevant in the material's elements.

Bioaccumulation: Not relevant; material has low mobility and limited, localized use.

Mobility: The material has poor mobility under normal environmental conditions.

Other adverse effects: Predicted No Effect Concentration (PNEC) = N/A

-FeSi is not considered to cause harm to aquatic organisms (Lillicrap, NIVA, 2011). FeSi is not a marine pollutant.

Section 13: DISPOSAL CONSIDERATIONS

The material should be recovered, wet or dry, for recycling and re-use where/when possible. Avoid repacking wet material, upon recovery, in sealed containers. Prior to disposal of material, contact the manufacturer and/or the nearest Environmental Agency for advice. Dispose of in accordance with applicable federal, state, provincial, and local regulations. Material is not a listed RCRA Hazardous Wastes (40 CFR 261), nor by Commission Decisions 2000/532/EC and 2001/118/EC.

Section 14: TRANSPORTATION INFORMATION

Proper Shipping Name:	Ferrosilicon UN-1408 (For transportation via water or international)
United States Department Of Transportation Classification:	Proper Shipping Name: Ferrosilicon. Hazard Class: Not regulated. ID Number and Initials: Not regulated. Packing Group: Not regulated. Label(s): Not regulated.
International UN Number:	1408
DOT 49 CFR	Not Regulated for Transportation
Canada-TDG:	Not Regulated for Transportation
BC-Number:	022
IMDG-Code:	Not Regulated for Transportation, unless shipped a solid bulk cargo. In this case, product must ship as UN1408, Water Reactive Solid, n.o.s. (Ferrosilicon), 4.3, PG III.
ICAO/IATA:	Not Regulated for Transportation
ADR/RID:	Not Regulated for Transportation
GHS/CLP (EC) No. 1272/2008:	Not Regulated for Transportation

The product, as described in Section 3, has been tested according to the Code of Federal Regulations, Title 49, and the "United Nations Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria Part III-33.4.1.4" and has passed the test. Consequently, the product is not classified as Class 4.3 Dangerous When Wet product.
The product, shipped as solid bulk cargo as defined by the International Maritime Solid Bulk Cargoes Code, must be shipped as Class 4.3 Dangerous When Wet material.

Section 15: REGULATORY INFORMATION

This Safety Data Sheet is prepared in compliance with: Regulation EC 1907/2006 of 12/18/2006 (REACH), Regulation EC 1272/2008 of 12/16/2008 (CLP), and OSHA 29 CFR 1910.1200 of 05/25/2012 (HCS).

TSCA (Toxic Substance Control Act): Ferrosilicon is listed.

CERCLA (Comprehensive Response Compensation and Liability Act): Ferrosilicon is not listed in 40 CFR 302.4.

RCRA (Resource Conservation Recovery Act): Ferrosilicon is not a listed hazardous waste.

SARA Title III (Superfund Amendments and Reauthorization Act):

- 311/312 Hazard Categories: Immediate Health, Delayed Health, Fire
- 313 Reportable Ingredients: Chromium, Copper, Manganese, Nickel

Regulation (EC) No. 1272/2008; (EC) No. 1907/2006 (REACH); EINECS (European Inventory of Existing Commercial Chemical Substances): The material is not listed on the REACH/EINECS inventories. Components of this material are listed in the Publishable Phased-in Substances Registered under REACH (Section 3-EC #).

Section 16: OTHER INFORMATION

According to Chapter 1.5.2 of the UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS), safety data sheets (SDS) are only required for substances and mixtures that meet the harmonized criteria for physical, health or environmental hazards. This product does not meet these criteria, and is not classified as hazardous under CLP Regulation (1272/2008/EC), or as dangerous under the Dangerous Substances Directive (67/548/EEC). The product is also not a persistent bio-accumulative and toxic, a very persistent/very bio-accumulative (Annex XIII REACH), and not listed in the ECHA candidate list of substances of very high concern. The purpose of this sheet is to communicate pertinent health, safety, & environmental information for the users of the material. Handling practices set forth herein are recommended minimums. This information may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy themselves as to the suitability and completeness of this information for the user's own, particular use. CC Metals and Alloys, LLC assumes no responsibility in the safe handling of the material by others & makes no representation or warranty, expressed or implied, as to completeness, accurateness, or currency of any data contained herein.

Prepared by CC Metals and Alloys, LLC Safety Department (270) 395-2113