MUADINOON Mining Company

Material Safety Data Sheet

Product Name: Silica Sand and Ground Silica
Product Description: Crystalline Silica

1. Identification of the substance/preparation and of the company/undertaking

1.1. Identification of the substance or preparation

Product Name/Trade Names:
Sand and Ground Silica Sand (sold under various names: ASTM TESTING SANDS • GLASS SAND FLINT SILICA • MASON SAND

Chemical Name or Synonym:
Crystalline Silica (Quartz), Sand, Silica Sand, Flint, Ground Silica, Silica Flour. White or tan sand or ground silica with no odor.

1.2. Use of the Substance/Preparation

Main Applications (non-exhaustive list): brick, ceramics, foundry castings, glass, grout, hydraulic fracturing sand, frac sand, proppant, mortar, paint and coatings, silicate chemistry, silicone rubber, thermoset plastics.

1.3. Company / Producer

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2. Hazards Identification

2.1. EMERGENCY OVERVIEW:

The material is white or tan sand, or ground sand. It has no odor and is not flammable, combustible or explosive. It does not cause burns or severe skin or eye irritation. A single exposure will not result in serious adverse health effects. Crystalline silica is not known to be an environmental hazard.

Personal protective equipment — respirator — is not required unless the concentration of respirable silica dust exceeds applicable occupational exposure levels.

Crystalline silica (quartz) is incompatible with hydrofluoric acid, fluorine, chlorine trifluoride or oxygen difluoride.

2.2. POTENTIAL HEALTH EFFECTS: The potential health effects are CHRONIC; the route of exposure is INHALATION; the hazards described are associated with respirable crystalline silica dust— respirable dust particles are less than 10 microns in aerodynamic diameter.

2.3.1. Inhalation:

a. Silicosis: The prolonged repeated inhalation of respirable crystalline silica can cause silicosis, a fibrosis (scarring) of the lungs.(less than 10 microns in aerodynamic diameter)

b. Tuberculosis: Silicosis increases the risk of tuberculosis.(less than 10 microns in aerodynamic diameter)

c. Non-Malignant Respiratory Diseases (other than silicosis): Some studies show an increased incidence in chronic bronchitis and emphysema in workers exposed to respirable crystalline silica.

2.3.2. Eye Contact:
Crystalline silica (sand or ground silica) may cause abrasion of the cornea.(Less than 10 microns in aerodynamic diameter)

2.3.3. Skin Contact:
Not applicable.

2.34. Ingestion:
Not applicable.

2.3.5. Chronic Effects:
The adverse health effects— silicosis, lung cancer, autoimmune and chronic kidney diseases, tuberculosis, and non-malignant respiratory diseases — are chronic effects.

2.3.6. Signs and Symptoms of Exposure:
Generally, there are no signs or symptoms of exposure to crystalline silica; silicosis may result in shortness of breath, especially upon exertion.

2.3.7. Medical Conditions Generally Aggravated by Exposure:
The condition of individuals with lung disease (e.g., bronchitis, emphysema, chronic obstructive pulmonary disease) can be aggravated by exposure.

2.3.8 Potential Environmental Effects
None known.

See Section 11, Toxicological Information, for additional detail on potential adverse health effects.

3. Composition / Information on Ingredients

Component / CAS #			Hazardous under OSHA Haz Comm Standard?
Crystalline Silica (quartz)	14808-60-7	99.0-99.9	Yes(less than 10 microns in aerodynamic diameter)
Aluminum Oxide	1344-28-1	<l.o	No
Iron Oxide	1309-37-1		No
Titanium Oxide	13463-67-7		No

4. First Aid Measures

4.1. Eye Exposure:
Wash immediately with plenty of water. If irritation persists, seek medical attention.

4.2. Skin Exposure:
Not applicable

4.3. Inhalation:
No specific first-aid is necessary since the adverse health effects associated with inhalation of respirable crystalline silica result from chronic exposures. If there is a gross inhalation of crystalline silica, remove the person immediately to fresh air, give artificial respiration as needed, seek medical attention as needed.

4.4. Ingestion:
Not applicable

5. Fire Fighting Measures

5.1. Fire Hazard Data:

Auto ignition: Not Applicable

Flash Point: Not Applicable

Flammability Limits (vol/vol%):	Lower:	Upper:
	Not Applicable	Not Applicable

Extinguishing Media:
Product is not flammable, combustible or explosive. Use extinguishing media appropriate for surrounding fire.

Special Fire Fighting Procedures:
Not applicable.

Unusual Fire and Explosion Hazards:
None

6. Accidental Release Measures

6.1. Personal precautions:

Avoid generating dust. If the concentration of respirable silica dust exceeds the OSHA PEL or other applicable limit (if lower than the PEL), wear respirator specified in Section 8 of this Safety Data Sheet.

Environmental precautions: No specific precautions. Discard any product, residue, disposable container or liner in compliance with regulatory requirements.

Methods for cleaning up: Avoid dry sweeping. Do not use compressed air to clean spilled sand or ground silica. Use water spraying/flushing or ventilated or HEPA filtered vacuum cleaning system. Dispose of in closed containers.

7. Handling and Storage

7.1. Handling:

Avoid generating dust. Do not breathe dust. Do not rely on your sight to determine if dust is in the air. Respirable crystalline silica dust may be in the air without a visible dust cloud.

Use adequate exhaust ventilation and dust collection. Maintain and test ventilation and dust collection equipment. Use all available work practices to control dust exposures, such as water sprays. Practice good housekeeping. Do not permit dust to collect on walls, floors, sills, ledges, machinery, or equipment. Keep airborne dust concentrations below permissible exposure limits.

Where necessary to reduce exposures below the PEL or other applicable limit (if lower than the PEL), wear a respirator approved for silica containing dust when using, handling, storing or disposing of this product or bag. See Section 8, for further information on respirators.. Do not alter the respirator. Do not wear a tight-fitting respirator with facial hair such as a beard or mustache that prevents a good face to face piece seal between the respirator and face. Maintain, clean, and fit test respirators in accordance with applicable standards. Wash or vacuum clothing that has become dusty.

Participate in training, exposure monitoring, and health surveillance programs to monitor any potential adverse health effects that may be caused by breathing respirable crystalline silica.

The OSHA Hazard Communication Standard, 29 CFR Sections 1910.1200, 1915.1200, 1917.28, 1918.90, 1926.59 and 1928.21, and state and local worker or community "right-to-know" laws and regulations should be strictly followed.

7.2. Storage

Use dust collection to trap dust produced during loading and unloading. Keep containers closed and store bags to avoid accidental tearing, breaking, or bursting.

7.3. Specific uses

Apply safe handling recommendations in Section 7.1.

8. Exposure Controls / Personal Protection

8.1. Local Exhaust Ventilation:

Use sufficient local exhaust ventilation to reduce the level of respirable crystalline silica to below the OSHA PEL or other applicable limit (if lower than PEL). See ACGIH "Industrial Ventilation, A Manual of Recommended Practice" (latest edition).

8.2. Respiratory Protection:

If it is not possible to reduce airborne exposure levels to below the OSHA PEL or other applicable limit with ventilation, use the table below to assist you in selecting respirators that will reduce personal exposures to below the OSHA PEL This table is part of the NIOSH Respirator Selection Logic, 2004, Chapter Ill, Table I, "Particulate Respirators". The full document can be found at www.cdc.gov/niosh/npptl/topics/respirators; the user of this MSDS is directed to that site for information concerning respirator selection and use. The assigned protection factor (APF) is the minimum anticipated level of protection provided by each type of respirator worn in accordance with an adequate respiratory protection program. For example, an APF of 10 means that the respirator should reduce the airborne concentration of a particulate by a factor of 10, so that if the workplace concentration of a particulate was 150 ug/m , then a respirator with an APF of 10 should reduce the concentration of particulate to 15 ug/m 3.

Assigned protection 1 factor	Type of Respirator (Use only NIOSH-certified respirators
10	Any air-purifying elastomeric half-mask respirator equipped with appropriate type of particulate filter.2 Appropriate filtering facepiece respirator. Any air-purifying full facepiece respirator equipped with appropriate type of particulate filter. An n e ressure demand su lied-air res iratore ui ed with a half-mask.
25	Any powered air-purifying respirator equipped with a hood or helmet and a high efficiency (HEPA) filter. Any continuous flow su lied-air res irator equip ed with a hood or helmet.
50	Any air-purifying full facepiece respirator equipped with N-IOO, R-IOO, or P-IOO filter(s). Any powered air-purifying respirator equipped with a tight-fitting facepiece (half or full facepiece) and a high-efficiency filter. Any negative pressure (demand) supplied-air respirator equipped with a full facepiece. Any continuous flow supplied-air respirator equipped with a tight-fitting facepiece (half or full facepiece).
1,000	Any pressure-demand supplied-air respirator eq uipped with a half-mask.

1. The protection offered by a given respirator is contingent upon (1) the respirator user adhering to complete program requirements (such as the ones required by OSHA in 29CFR1910.134), (2) the use of NIOSH-certified respirators in their approved configuration, and (3) individual fit testing to rule out those respirators that cannot achieve a good fit on individual workers.
2. Appropriate means that the filter medium will provide protection against the particulate in question.
3. An APF of 10 can only be achieved if the respirator is qualitatively or quantitatively fit tested on individ ual workers.

8.3. Exposure controls

8.3.1. Occupational exposure controls / guidelines

Component	CAS No.	OSHA PEL		ACGHI TLV		NISOSH REL		
		TWA	STEL	TWA	STEL	TWA	STEL	unit
Crystalline Silica (quartz)	14808-60-7	% Si02 +2	None	0.025	None	0.05	None	mg / m^s

If crystalline silica (quartz) is heated to more than 870^{0}C, quartz can change to a form of crystalline silica known as tridymite; if crystalline silica (quartz) is heated to more than1470 ^{0} C, quartz can change to a form of crystalline silica known as cristobalite. It OSHA PEL for crystalline silica as tridymite or cristobalite is one-half of the OSHA PEL for crystalline silica (quartz).

Engineering Controls:
Ventilation must be adequate to maintain the crystalline silica concentrations in the workplace air below the exposure limit(s) outlined in Section 8.3.1 of this Safety Data Sheet.

Respiratory Protection
In case of exposure to dust, and in any case if such exposure is above regulatory limits (see above), wear a personal respirator as outlined in Section 8.2 above.

Eye / Face Protection:
If eye contact while using product may be anticipated, wear appropriate safety glasses with side shields or chemical goggles [as described by European Standard EN 166].

Skin Protection
Maintain good industrial hygiene. Protection recommended for workers suffering from dermatitis or sensitive skin.

8.3.2. Environmental Exposure Controls

No special requirements. There is no reported ecotoxicity for silica, a naturally occurring substance abundantly present in nature.

9. Physical and Chemical Properties

9.1. General Information

Physical State: White or tan sand: granular, crushed or ground to a powder.
Odor: None

9.2. Important Health, Safety and Environmental Information

pH: 6-8 Specific Gravity: 2.65 g/cc
Melting Point: 31100F/17100C Freezing Point
Not Applicable Boiling Point:
40460F/22300C
Flashpoint: Not Applicable Flammability: Not Applicable
Explosive properties: Not Applicable
Oxidizing properties: contact with powerful oxidizing agents such as fluorine, chlorine trifluoride, and oxygen difluoride may cause fires.

Vapor Pressure: None
Relative Density: Not Applicable
Solubility: Silica will dissolve in hydrofluoric acid and produce a corrosive gas, silicon tetrafluoride
Water Solubility: Insoluble
Percent Volatiles by Volume; Not Applicable
Viscosity: Not Applicable

Vapor density:	Not Applicable
Molecular Weight:	60.08
Evaporation rate:	Not Applicable

10. Stability and Reactivity

10.1. Chemical Stability:
Stable

10.2. Conditions to Avoid:
Contact with powerful oxidizing agents such as fluorine, chlorine trifluoride, and oxygen difluoride may cause fires.

10.3. Materials / Chemicals to Be Avoided:
Contact with powerful oxidizing agents, such as fluorine, chlorine trifluoride and oxygen difluoride, may cause fires.

10.4. Hazardous Decomposition Products:
Will not occur.

10.5. Hazardous Polymerization:
Will not occur.

11. Toxicological Information

The method of exposure that can lead to the adverse health effects described below is inhalation.

A. SILICOSIS
The major concern is silicosis, caused by the inhalation of respirable crystalline silica dust. Silicosis can exist in several forms, chronic (or ordinary), accelerated, or acute.

Chronic or Ordinary Silicosis is the most common form of silicosis, and can occur after many years (15 to 20 or more) of prolonged repeated inhalation of relatively low levels of airborne respirable crystalline silica dust. It is further defined as either simple or complicated silicosis. Simple silicosis is characterized by lung lesions (shown as radiographic opacities) less than 1 centimeter in diameter, primarily in the upper lung zones. Often, simple silicosis is not associated with symptoms, detectable changes in lung function or disability. Simple silicosis may be progressive and may develop into complicated silicosis or progressive massive fibrosis (PMF). Complicated silicosis or PMF is characterized by lung lesions (shown as radiographic opacities) greater than I centimeter in diameter. Although there may be no symptoms associated with complicated silicosis or PMF, the symptoms, if present, are shortness of breath and cough. Complicated silicosis or PMF may be associated with decreased lung function and may be disabling. Advanced

complicated silicosis or PMF may lead to death. Advanced complicated silicosis or PMF can result in heart disease secondary to the lung disease (cor pumonale).

Accelerated Silicosis can occur with prolonged repeated inhalation of high concentrations of respirable crystalline silica over a relatively short period; the lung lesions can appear within five (5) years of initial exposure. Progression can be rapid. Accelerated silicosis is similar to chronic or ordinary silicosis, except that lung lesions appear earlier and progression is more rapid.

Acute Silicosis can occur after the repeated inhalation of very high concentrations of respirable crystalline silica over a short time period, sometimes as short as a few months. The symptoms of acute silicosis include progressive shortness of breath, fever, cough, weakness and weight loss. Acute silicosis is fatal.

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B. CANCER

IARC- The International Agency for Research on Cancer ("IARC") concluded that "crystalline silica in the form of quartz or cristobalite dust is carcinogenic to humans (Group 1)". For further information on the IARC evaluation, see IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume IOOC,"A Review of Human Carcinogens: Arsenic, Metals, Fibres and Dusts " (2011).

c. AUTOIMMUNE DISEASES

Several studies have reported excess cases of several autoimmune disorders, — scleroderma, systemic lupus erythematosus, rheumatoid arthritis — among silica-exposed workers.).

D. TUBERCULOSIS

Individuals with silicosis are at increased risk to develop pulmonary tuberculosis, if exposed to tuberculosis bacteria. Individuals with chronic silicosis have a three-fold higher risk of contracting tuberculosis than similar individuals without silicosis.

E. KIDNEY DISEASE

Several studies have reported excess cases of kidney diseases, including end stage renal disease, among silicaexposed workers. For additional information on the subject, the following may be consulted: "Kidney Disease and Silicosis", Nephron, Volume 85, pp. 14-19 (2000).

12. Ecological Information

12.1. Ecotoxicological Information:

Crystalline silica (quartz) is not known to be ecotoxic; i.e., no data suggests that crystalline silica (quartz) is toxic to birds, fish, invertebrates, microorganisms or plants.

13. Disposal Considerations

13.1. Waste Disposal Method:

Discard any product, residue, disposable container or liner in full compliance with national regulations.

13.2. Container Handling and Disposal:
Dispose of container and unused contents in accordance with national regulations.

14. Transportation Information

Shipping Name:

ADR/RID/IMO/ICAO /US DOT	Proper Shipping Name	Not Regulated
	Hazard Class	Not Regulated
	ID Number	Not Regulated
	Packaging Group	Not Regulated

Crystalline silica (quartz) is not a hazardous material for purposes of transportation under the U. S. Department of Transportation Table of Hazardous Materials, 49 CFR 5172.101.

15. Regulatory Information

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Silica sand has no harmonized classification & labeling under Directives 67/548/EEC and 1999/45/EC. Because the respirable fraction is high (10% and more) in ground silica (flour), the preparation is selfclassified as Xn (harmful). In such case, the following risk and safety phrases are applicable.

Risk Phrases:

R 48/20: Harmful: danger of serious damage to health by prolonged exposure through inhalation. Safety Phrases:

S 22: Do not breathe dust.

S 38: In case of insufficient ventilation, wear suitable respiratory equipment.

16. Other Information

16.1 Hazardous Material Information System (HMIS):

Health
Flammability
Reactivity
Protective Equipment E

* For further information on health effects, see Sections 2, 8 and 11 of this MSDS.

16.2 National Fire Protection Association (NFPA):

Health
Flammability
Reactivity

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The information and recommendations contained herein are based upon data believed to be upto-date and correct. However, no guarantee or warranty of any kind, express or implied, is made with respect to the information contained herein. We accept no responsibility and disclaim all liability for any harmful effects that may be caused by purchase, resale, use or exposure to our silica. Customers and users of silica must comply with all applicable health and safety laws, regulations, and orders. In particular, they are under an obligation to carry out a risk assessment for the particular work places and to take adequate risk management measures in accordance with the national implementation legislation-

Date: May 2018